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Preliminary Information

Volume 7-3
Technology Demonstration
Missions Data Book
D180-27477-7-3

Space Station Needs, Attributes, and Architectural Options Study

(NASA-CR-173699) SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY Final Report (Boeing Co., Seattle, Wash.) 330 p HC A15/MF A01 CSCL 22B

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Arthur D. Little, Inc. Battelle Life Systems, Inc. HAMILTON STANDARD Division of United Technologies RCA

Environmental Research Institute of Michigan INTERMETRICS Microgravity Research Associates, Inc. Econ

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Space Station
Needs, Attributes and Architectural Options Study

Contract NASW-3680

D180-27477-7

Final Report

Volume 7 - 3

Data Book

Technology Development Missions

April 21, 1983

for

National Aeronautics and Space Administration

Headquarters

Washington, D. C.

Approved by ______________________

Gordon Woodcock,
Study Manager

Boeing Aerospace Company

P. O. Box 3999

Seattle, Washington 98124

BOEING

FOREWORD

The Space Station Needs, Attributes and Architectural Options Study (Contract NASW-3680) was initiated in August of 1982 and completed in April of 1983. This was one of eight parallel studies conducted by aerospace contractors for NASA Headquarters. The Contracting Officer's Representative and Study Technical Manager was Brian Pritchard. The Boeing study manager was Gordon R. Woodcock.

The study was conducted by Boeing Aerospace Company and its team of subcontractors:

Arthur D. Little, Inc. (ADL)	Materials Processing in Space
Battelle Columbus Laboratories	Materials Processing in Space
ECON, Inc.	Pricing Policies and Economic Benefits
Environmental Research Institute of Michigan (ERIM)	Earth Observation Missions
Hamilton Standard	Environmental Control and Life Support Equipment
Intermetrics, Inc.	Software
Life Systems, Inc. (LSI)	Environmental Control and Life Support Equipment
Microgravity Research Associates (MRA)	Materials Processing in Space
National Behavioral Systems (NBS)	Crew Accommodations and Architectural Influences
RCA Astro-Electronics	Communications Spacecraft
Science Applications, Inc. (SAI)	Space Science

This document is one of seven final report documents:

D180-27477-1	Volume 1, Executive Summary
D180-27477-2	Volume 2, Mission Analysis
D180-27477-3	Volume 3, Requirements
D180-27477-4	Volume 4, Architectural Options, Subsystems, Technology, and Programmatics
D180-27477-5-1	Volume 5-1, National Defense Missions and Space Station Architectural Options Final Report (SECRET)
D180-27477-5-2	Volume 5-2, National Defense Missions and Space Station Architectural Options, Final Briefing (SECRET)
D180-27477-6	Volume 6, Final Briefing

D180-27477-7-1	Volume 7-1, Science and Applications Missions Data Book
D180-27477-7-2	Volume 7-2, Commerical Missions Data Book
D180-27477-7-3	Volume 7-3, Technology Demonstration Missions Data Book
D180-27477-7-4	Volume 7-4, Architectural Options, Technology, and Programmatics Data Book
D180-27477-7-5	Volume 7-5, Mission Analysis Data Book

Note: The volume 7 data books will be distributed to a limited number of requestors.

The study task descriptions and a final report typical cross reference guide are found in Appendix 1.

The Boeing and subcontractor team member are listed in Appendix 2.

Acronyms and abbreviations are listed in Appendix 3.

7.3.1 Introduction

Section 7-3 is the repository for all the candidate Technology Development missions investigated during the Space Station Needs, Attributes, and Architectural Options Study. All the mission data forms plus additional information such as, cost, drawings, functional flows, etc., generated in support of these missions is included with a computer generated mission data form. Table 7.3.1-1 is the index for the valid mission data forms. Table 7.3.1-2 is the index for the remaining mission data forms.

7.3.2 Candidate Missions

Utilizing NASA data, literature search, and Boeing data, a list of candidate Technology Development missions was developed. These missions were then researched and the resulting information entered into a Boeing VAX computer for use as a mission computer data base.

7.3.3 Mission Screening

Reviewing the mission data forms, it became apparent that there was considerable overlap with other missions and the commercial and science and applications missions. It was also determined that some missions would be accomplished on the shuttle or that they did not need to be accomplished on the Space Station. In order to organize the data base and reduce the number of missions, the missions were put through a reasonableness/overlap screen. The results of this screen resulted in Table 7.3.3-1 which gave us a reduced list of 34 valid missions, Table 7.3.1-1.

7.3.1-1 VALID MISSIONS

BACX2001	PASSIVE MW RADIOM (LSS-3)
BACX2006	ZERO-G BROMINE PHASE SEPARATION
BACX2009	SPACE COMPONENT LIFETIME TECH
BACX2011	LIQUID DROPLET RADIATOR
BACX2012	ION THRUSTER EFFECT ON LEO POWER
BACX2013	CREW SYSTEMS-EMESIS STATION
BACX2014	DISHWASHER/CLOTHES WASHER
BACX2018	FIRE SAFETY TECHNOLOGY
BACX2019	TETHER DYNAMICS TECHNOLOGY
BACX2020	LARGE SPACE POWER SYSTEM TECH
BACX2024	LOW COST MODULAR SOLAR PANEL TEC
BACX2026	MULTI-FREQ HIGH GAIN ANTENNA
BACX2027	SINGLE CRYSTAL RHODIUM WAFERS
BACX2029	HABITABILITY CRITERIA VALIDATION
BACX2034	SPACECRAFT HANGAR (LSS-2)
BACX2035	MATERIALS EXPOSURE LAB
BACX2036	PRECISION OPTICAL SYSTEM (LSS-4)
BACX2037	CONST & STORAGE FAC (LSS-1)
BACX2059	MANIPULATOR DEVELOP & TEST FACIL
BACX2060	SHOWER STATION
BACX2061	TRASH MANAGEMENT
BACX2063	PROP TRANSFER TECH DEMO (OTV-1)
BACX2064	PROP STORAGE TECH DEMO (OTV-2)
BACX2065	RNDZVS,DCKG,BRTHG TECH DEMO (OTV
BACX2066	OTV MAINT TECH DEMO (OTV-4)
BACX2067	PAYLOAD/OTV INTEG TECH DEMO (OTV
BACX2068	CLOSED ECLS FOR SPACE STATION
BACX2069	SOLAR ARRAY ADDITION TECH DEMO (
BACX2070	FORMATION FLYING TECH DEMO (SS-2
BACX2071	SATELLITE ASSY TECH DEMO (SS-3)
BACX2072	ON-BOARD SAT SERV TECH DEM (SS-4
BACX2073	INSITU SAT UNMANNED SERV (SS-5)
BACX2074	SURFACE INTERACTION W/RCS PLUME
BACX2075	ROBOTICS

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TABLE 7.3.1-2 CANDIDATE MISSIONS

BACX2000	EARTH OBSERVATION INST DEV MAPS
BACX2002	EARTH OBSERVATION INSTR DEVELOP
BACX2003	SATELLITE DOPPLER METEOR RADAR
BACX2004	MICROWAVE REMOTE SENS TECH
BACX2005	EARTH FEATURE IDENTIFICATION
BACX2007	EARTHBOUND ORIENTED INST DEV
BACX2008	LARGE SOLAR CELL
BACX2010	MATERIALS & COATING TECHNOLOGY
BACX2015	CRYOGENIC FLUID STORAGE TECH
BACX2016	CRYOGENIC LIFETIME TECHNOLOGY
BACX2017	FLUID MANAGEMENT TECHNOLOGY
BACX2021	TEST SOLAR-PUMPED LASERS
BACX2022	LASER-TO-ELECTRIC ENERGY CONVERS
BACX2023	SOLAR-SUSTAINED PLASMAS
BACX2025	LASER COMM & TRACKING DEVELOP EX
BACX2028	LASER PROPULSION TEST
BACX2030	MANIPULATOR CONTROLS TECH
BACX2031	SATELLITE SERVICING TECHNOLOGY
BACX2032	OTV SERVICING TECH
BACX2033	SPACECRAFT STRAIN & ACOUSTIC EMI
BACX2038	LARGE STRUCTURES TECH EXPERIMENT
BACX2039	ATTITUDE CONTROL-SYSTEM IDENT
BACX2040	ATTITUDE CONTROL-ADAPTIVE CONTRO
BACX2041	ATTITUDE CONTROL DIST CONTROL
BACX2042	ZERO-G ANTENNA RANGE COMM EXP
BACX2043	DYNAMICS OF LIGHTLY LOADED STRUC
BACX2044	SPACECRAFT MATERIALS TECHNOLOGY
BACX2045	SPACECRAFT CONTROL TECH DEVELOP
BACX2046	ADVANCED CONTROL DEVICE TECH DEM
BACX2047	THERMAL SHAPE CONTROL TECHNOLOGY
BACX2048	ACTIVE OPTICS TECHNOLOGY
BACX2049	GEODESIC SPHERICAL STRUCTURES
BACX2050	LARGE SPACE STRUCTURE TECHNOLOGY
BACX2051	CONTROLLED ACCELERATION PROP
BACX2052	TELEOPERATOR REAL TIME COMM
BACX2053	LARGE ANTENNA DEVELOPMENT
BACX2054	FAB OF LIGHTWEIGHT CRYO HEAT PIPE
BACX2055	ADV ADAPTIVE CONTROL TECH DEMO
BACX2056	SOLAR PUMPED LASERS
BACX2057	MATERIALS PROC TECH-PROC & TECH
BACX2058	ELECTROPHORESIS SEPARATION
BACX2062	CRYOGENIC FLUID STORAGE TECH
BACX2076	COMPOUND SEMICONDUCTOR CRYSTALS

Table 7.3.3-1. Technology Development Mission Summary

MISSION		TYPE	ACCOMPLISH IN: SCIENCE AND APPLICATIONS	ACCOMPLISH IN: COMMERCIAL	ACCOMPLISH IN: COMBINED WITH	REJECT NO MISSION OR TECHNOLOGY
BACX2000	EARTH OBSERVATION INST DEV MAPS		0451			
BACX2001	PASSIVE MW RADIOM (LSS-3)	10				
BACX2002	EARTH OBSERVATION INSTR DEVELOP		0451			
BACX2003	SATELLITE DOPPLER METEOR RADAR		0003			
BACX2004	MICROWAVE REMOTE SENS TECH		0453 0453			
BACX2005	EARTH FEATURE IDENTIFICATION		0451			
BACX2006	ZERO-G BROMINE PHASE SEPARATION	11				
BACX2007	EARTH BOUND ORIENTED INST DEV		0401			
BACX2008	LARGE SOLAR COLL (LSS-6)	10			2035	
BACX2009	SPACE COMPONENT LIFETIME TECH	15				
BACX2010	MATERIALS & COATING TECHNOLOGY	10				
BACX2011	LIQUID DROPLET RADIATOR	16				
BACX2012	ION THRUSTER EFFECT ON LEO POWER	11				
BACX2013	CREW SYSTEMS-EMESIS STATION	15				
BACX2014	DISHWASHER/CLOTHES WASHER	15				
BACX2015	CRYOGENIC FLUID STORAGE TECHNOLOGY				2064	
BACX2016	CRYOGENIC LIFETIME TECHNOLOGY				2064	
BACX2017	FLUID MANAGEMENT TECHNOLOGY					ACCOMPLISHED ON SHUTTLE
BACX2018	FIRE SAFETY TECHNOLOGY	15				
BACX2019	TETHER DYNAMICS TECHNOLOGY	15				
BACX2020	LARGE SPACE POWER SYSTEM TECH	11				
BACX2021	TEST SOLAR-PUMPED LASERS				2066	
BACX2022	LASER-TO-ELECTRIC ENERGY CONVERS				2066	
BACX2023	SOLAR-SUSTAINED PLASMAS	11				
BACX2024	LOW COST MODULAR SOLAR PANEL TECH	11				
BACX2025	LASER COMM TRACKING DEVELOP	12			2066	
BACX2026	MULTI-FREQ HIGH GAIN ANTENNA	12				
BACX2027	SINGLE CRYSTAL RHODIUM WAFERS	10				
BACX2028	LASER PROPULSION TEST				2066	
BACX2029	HABITABILITY CRITERIA VALIDATION	14				
BACX2030	MANIPULATOR CONTROLS TECHNOLOGY				2069	
BACX2031	SATELLITE SERVICING TECHNOLOGY				71-73	
BACX2032	OTV SERVICING TECHNOLOGY				63-70	
BACX2033	SPACECRAFT STRAIN & ACOUSTIC EMI				2035	
BACX2034	SPACECRAFT HANGAR (LSS-2)	10				
BACX2035	MATERIALS EXPOSURE LAB	10				
BACX2036	PRECISION OPTICAL SYSTEM (LSS-4)	10				
BACX2037	CONST & STORAGE FAC (LSS-1)	10				
BACX2038	LARGE STRUCTURES TECH EXPERIMENT					
BACX2039	ATTITUDE CONTROL-SYSTEM IDENT				2031 2034 2001 2038	

Table 7.3.3-1. Technology Development Mission Summary (Continued)

MISSION		TYPE	ACCOMPLISHED IN: SCIENCE AND APPLICATIONS	ACCOMPLISHED IN: COMMERCIAL	ACCOMPLISHED IN: COMBINED WITH	REJECT NO MISSION OR TECHNOLOGY
BACX2040	ATTITUDE CONTROL-ADAPTIVE CONTROL				2001	
BACX2041	ATTITUDE CONTROL DIST CONTROL				2001	
BACX2042	ZERO-G ANTENNA RANGE COMM EXP				2001	
BACX2043	DYNAMICS OF LIGHTLY LOADED STRUCT				2001	
BACX2044	SPACECRAFT MATERIALS TECHNOLOGY				2035	
BACX2045	SPACECRAFT CONTROL TECH DEV.				2001	
BACX2046	ADVANCED CONTROL DEVICE TECH DEM				2001	
BACX2047	THERMAL SHAPE CONTROL TECHNOLOGY				2001	
BACX2048	ACTIVE OPTICS TECHNOLOGY				2036	
BACX2049	GEODESIC SPHERICAL STRUCTURES					X
BACX2050	LARGE SPACE STRUCTURE TECHNOLOGY				2037 2034	
BACX2051	CONTROLLED ACCELERATION PROPULSION					X
BACX2052	TELEOPERATOR REAL TIME COMM					X
BACX2053	LARGE ANTENNA DEVELOPMENT					X
BACX2054	FAB OF LIGHTWEIGHT CRYO HEAT PIPE					X
BACX2055	ADV ADAPTIVE CONTROL TECH DEMO					X
BACX2056	SOLAR PUMPED LASERS	15				
BACX2057	MATERIALS PROC TECH-PROC & TECH			1005 1006		
BACX2058	ELECTROPHORESIS SEPARATION			1005		
BACX2059	MANIPULATOR DEVELOP & TEST FACILITY	15				
BACX2060	SHOWER STATION	15				
BACX2061	TRASH MANAGEMENT	15				
BACX2062	CRYOGENIC FLUID STORAGE TECH.				2063 2064	
BACX2063	PROP TRANSFER TECH DEMO (OTV-1)	15				
BACX2064	PROP STORAGE TECH DEMO (OTV-2)	15				
BACX2065	RNDZVX, DCKG, BRTHE TECH DEMO (OTV)	15				
BACX2066	OTV MAINT TECH DEMO (OTV-4)	15				
BACX2067	PAYLOAD/OTV INTEG TECH DEMO (OTV)	15				
BACX2068	CLOSED ECLS FOR SPACE STATION	15				
BACX2069	SOLAR ARRAY ADDITION TECH DEMO	15				
BACX2070	FORMATION FLYING TECH DEMO (SS-2)	15				
BACX2071	SATELLITE ASSY TECH DEMO (SS-3)	15				
BACX2072	ON-BOARD SAT SERV TECH DEMO	15				
BACX2073	INSITU SAT UNMANNED SERV TECH DE	15				
BACX2074	SURFACE INTERACTION W/RCS PLUME	13				
BACX2075	ROBOTICS	15				
BACX2076	COMPOUND SEMICONDUCTOR CRYSTALS		1003 1004			

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7.3.4 Costs

In order to determine the magnitude of funding required to accomplish this list of valid missions, the mission equipment was subjected to a cost analysis. All pertinent data was submitted to the Boeing cost modeling and operations analysis group for analysis using the RCA PRICE hardware, or Boeing PCM hardware computer costing models.

As a result of this analysis and a preliminary prioritizing four additional Technology Development missions were deleted from the valid list.

7.3.5 Mission Scheduling

Scheduling was an iterative process to arrive at a satisfactory blend of demands on the Space Station accommodations, mission priorities, and budget constraints. The resulting mission schedule is shown in Table 7.3.5-1.

Table 7.3.5-1. Technology Development Schedule and Budget

MISSIONS		FLIGHT DATE	DURA-TION (MONTHS)	COST IN MILLIONS	FUNDING SOURCE
BACX2037	CONST AND STORAGE FAC (LSS-1)	91	12	61.3	TD
BACX2034	SPACECRAFT HANGAR (LSS 2)	91	12	6.6	TD
BACX2059	MANIPULATOR DEVELOP AND TEST FACILITY	91	24	100	SS
BACX2013	CREW SYSTEMS–EMESIS STATION	91	12	29	SS
BACX2014	DISHWASHER/CLOTHES WASHER	91	12	1.9	SS
BACX2060	SHOWER STATION	91	12	4	SS
BACX2061	TRASH MANAGEMENT	91	12	1.8	SS
BACX2068	CLOSED ECLS FOR SPACE STATION	91	12	51	SS
BACX2063	PROP TRANSFER TECH DEMO (OTV-1)	92	6	25.7	TD
BACX2064	PROP STORAGE TECH DEMO (OTV-2)	92	6	0	TD
BACX2069	SOLAR ARRAY ADDITION TECH DEMO	92	1	0	TD
BACX2066	OTV MAINT TECH DEMO (OTV-4)	93	24	29.5	TD
BACX2065	RNDZVX, DCKG, BRTHE TECH DEMO (OTV)	93	1	0	TD
BACX2071	SATELLITE ASSY TECH DEMO (SS-3)	94	36	25	TD
BACX2067	PAYLOAD/OTV INTEG TECH DEMO (OTV)	94	1	0	TD
BACX2070	FORMATION FLYING TECH DEMO (SS-2)	94	1	0	TD
BACX2072	ON-BOARD SAT SERV TECH DEMO (SS-4)	94	1	0	TD
BACX2018	FIRE SAFETY TECHNOLOGY	95	3	8.7	TD
BACX2020	LARGE SPACE POWER SYSTEM TECH	95	3	10	TD
BACX2029	HABITABILITY CRITERIA VALIDATION	95	12	1.2	TD
BACX2024	LOW COST MODULAR SOLAR PANEL TECH	95	3	1.7	TD
BACX2009	SPACE COMPONENT LIFETIME TECH	96	24	7.1	TD
BACX2027	SINGLE CRYSTAL RHODIUM WAFERS	96	3	2	TD
BACX2075	ROBOTICS	97	6	78	TD
BACX2073	INSITU SAT UNMANNED SERV TECH DEMO (SS-5)	97	1	0	TD
BACX2012	ION THRUSTER EFFECT ON LEO POWER	98	3	4.6	TD
BACX2035	MATERIALS EXPOSURE LAB	98	12	2.7	TD
BACX2006	ZERO-G BROMINE PHASE SEPARATION	99	6	3.9	TD
BACX2036	PRECISION OPTICAL SYSTEM (LSS-4)	00	12	81.1	TD
BACX2074	SURFACE INTERACTION W/RCS PLUME	01	3	.9	TD
BACX2001	PASSIVE MW RADIOM (LSS-3)	02	12	84.1	TD
BACX2019	TETHER DYNAMICS TECHNOLOGY	03	3		TD
BACX2011	LIQUID DROPLET RADIATOR	05	12	66.1	TD

TECHNOLOGY DEMONSTRATION MISSIONS DATA

This section contains the mission data forms, cost analysis forms, and configuration drawings of all of the potential technology demonstration missions. The data is provided in sequence of BACX code numbers.

PAYLOAD ELEMENT NAME
PASSIVE MW RADIOM (LSS-3)

CODE
BACX2061

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

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SEATTLE, WA 98124

Telephone 206/773-2020

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 2002 Number of Flights 1 Duration of Flight, Days 0

OBJECTIVE
LARGE SPACE STRUCTURES TECHNOLOGY DEMONSTRATIONS: DEPLOYMENT AND ASSEMBLY, SUBSYSTEM INSTALLATION AND CHECKOUT, DEMONSTRATE MAN'S ROLE AND CAPABILITIES IN SPACE, DEPLOYMENT OR INSTALLATION OF MEMBRANE SURFACE, SYSTEM IDENTIFICATION, ADAPTIVE CONTROL, ANTENNA TESTING, STRUCTURAL DYNAMICS, THERMAL CONTROL, SURFACE MANAGEMENT AND CONTROL, DAMPING AUGMENTATION, AND POINTING CONTROL.

DESCRIPTION
ASSEMBLE THE PASSIVE MICROWAVE RADIOMETER SATELLITE. DURING THE ASSEMBLY, THIS SPACECRAFT WOULD BE INSTRUMENTED AND TESTED TO DEMONSTRATE THE VARIOUS TECHNOLOGIES DEFINED ABOVE. AFTER TECH DEMOS ARE COMPLETED, THIS SPACECRAFT WOULD BE MOVED TO ITS DESIRED LOCATION AND MADE OPERATIONAL.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km >600 Perigee, km >600 Tolerance + -
Inclination, deg 60 Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar (X) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 36. Field of View (deg) 1
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	500	
Standby		(X) Continuous
Peak		
Voltage, V		Frequency, Hz

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None (X) Realtime (X) Offline ( ) Other:

( ) Encription/Decription Required

(X) Uplink Required: Command Rate (KBS): Frequency (MHz):

(X) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day

Film (Amount): Voice (Hours/Day):

Live TV (Hours/Day): Other:

On-Board Storage (Mbit):

Data Dump Frequency (Per Orbit) Downlink command rate:

Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL

( ) Active (X) Passive

Temperature, deg C Operational Minimum Maximum

Non-operational Minimum Maximum

Heat Rejection, w Operational Minimum Maximum

Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal (X) External (X) Remote

Equipment ID/Function ( ) Pressurized (X) Unpressurized

Length: 13 meters Width: 4 meters Height: 4 meters (Stowed)

Length: 104 meters Width: 104 meters Height: 80 meters (Deployed)

Launch mass, kg: 2000 Return mass, kg:

Consumable Types PROPELLANT

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size

Skills (See Table B)

Task Assignments

Skill	12	13	7	8	9	
Level	3	3	3	3	3	
Hours/Day						

EVA (X) Yes ( ) No Reason CONSTRUCTION Hours/EVA 888

SERVICING/MAINTENANCE

Service: Interval days Consumables kg

Returnables kg Man hours required

Configuration Changes: Interval days Man/Hours Required

Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

SURFACE ACCURACY REQUIREMENT WAVELENGTH/50

MICROWAVE FREQUENCY <5 GHZ

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
(X) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
(X) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	days
Mission Use	365 days/year
IVA Service	10 man-days/year
EVA Service	20 man-days/year
Experiment Ops	148 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

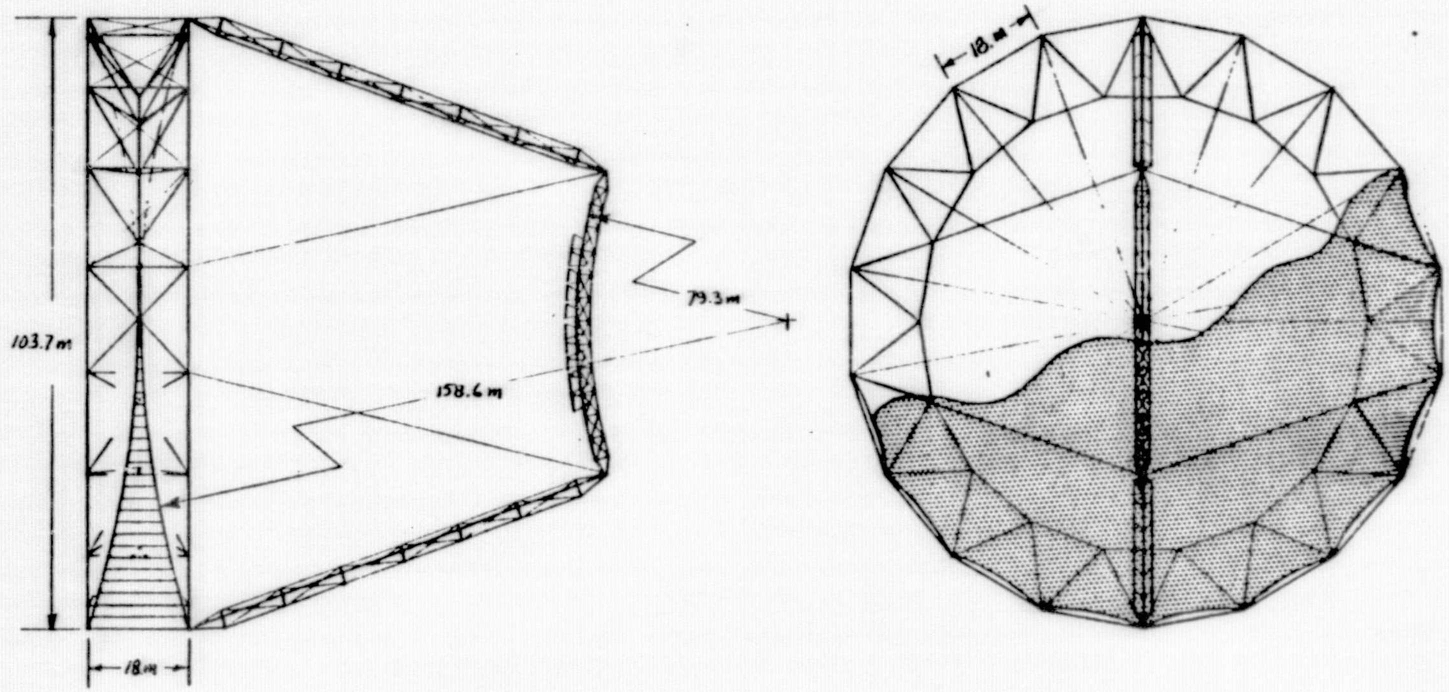
Support Equipment

Length:	2.5	meters	Width:	2.5	meters	Height:	1	meters	(Stowed)
Length:	26	meters	Width:	12	meters	Height:	3.5	meters	(Deployed)

Mass: 2000 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload



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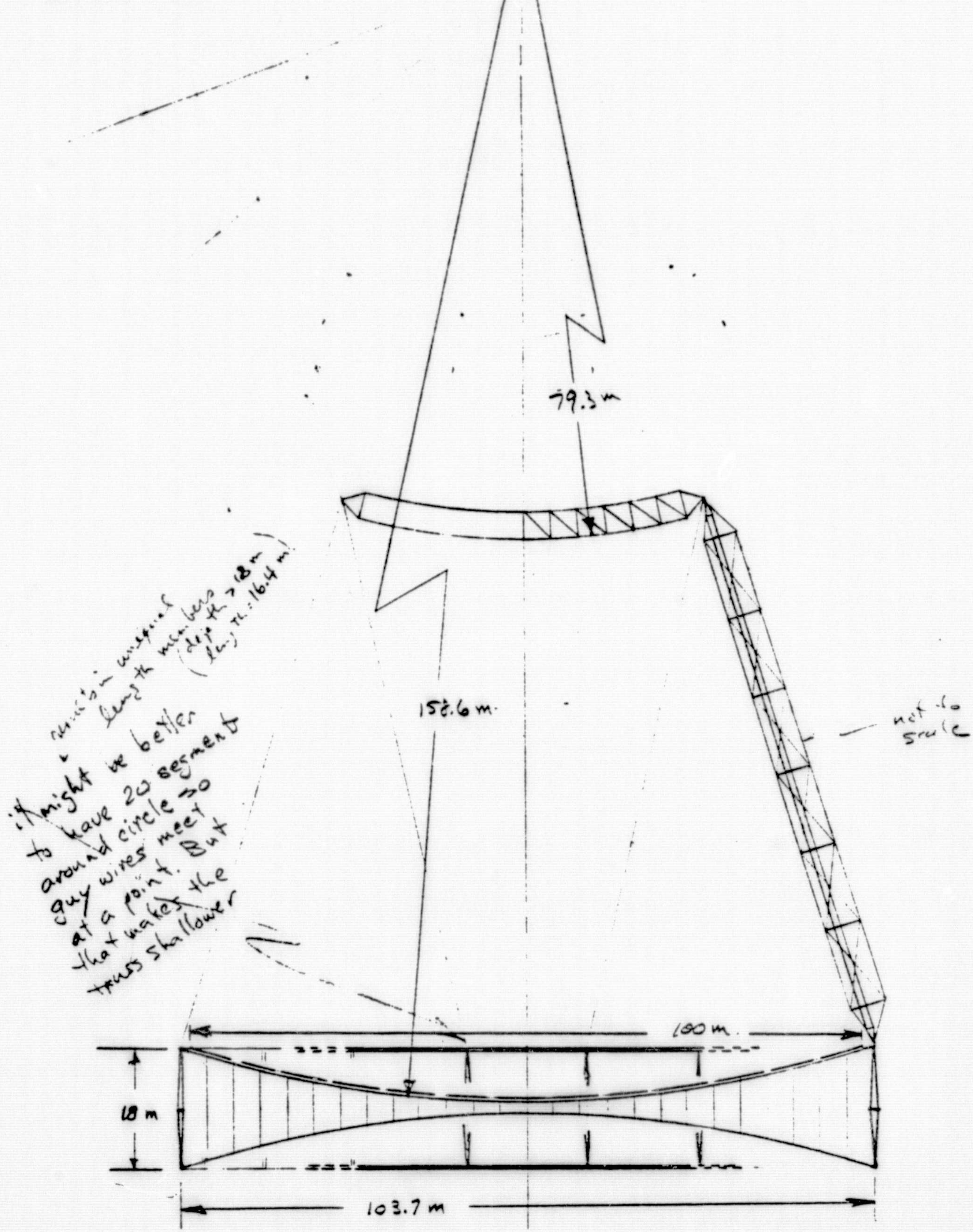
79.3 m
158.6 m
not to scale
100 m
18 m
103.7 m
it might be better to have 20 segments around circle so guy wires meet at a point. But that makes the truss shallower
results in unequal length members (depth > 18 m length: 16.4 m)

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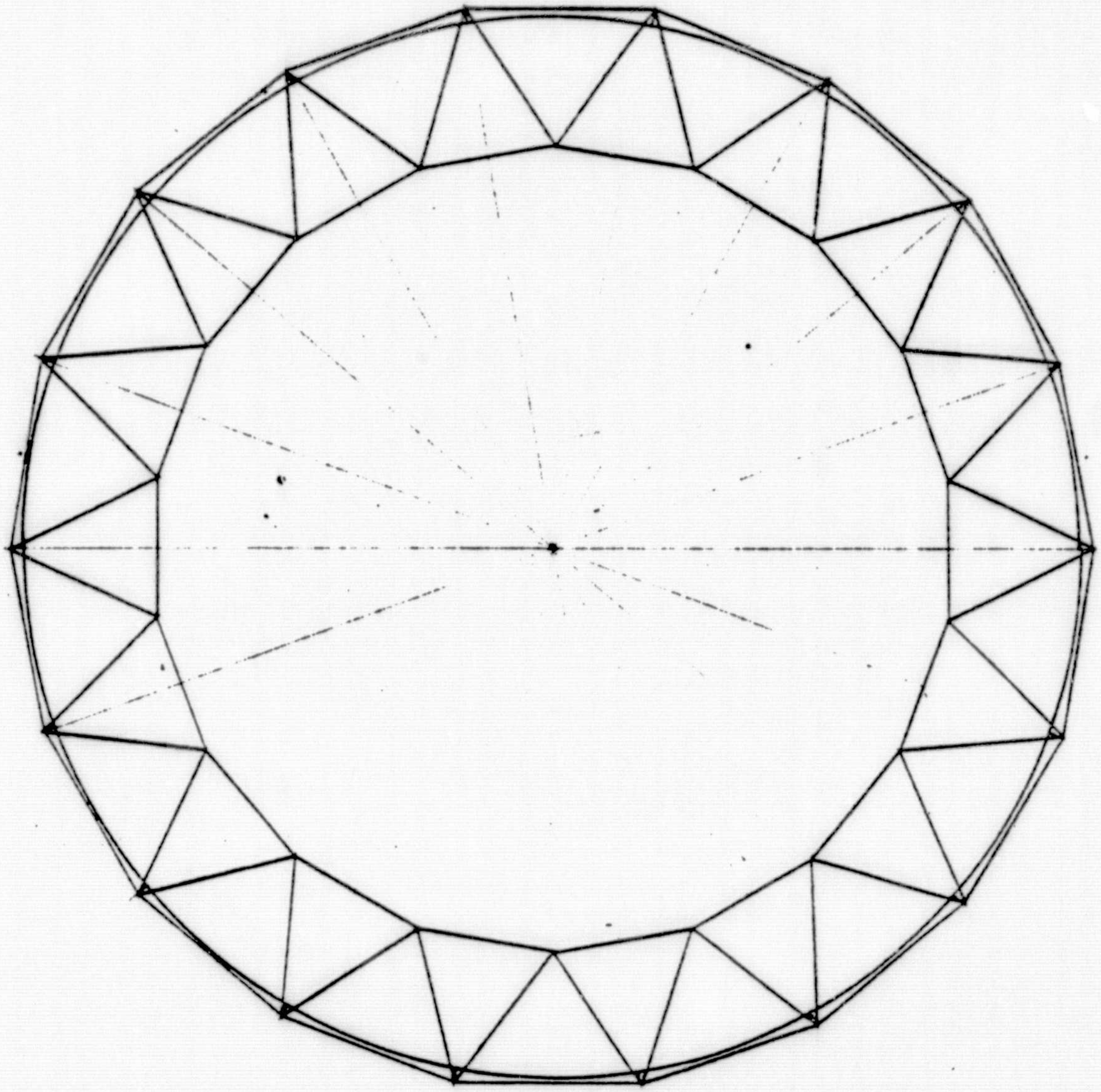

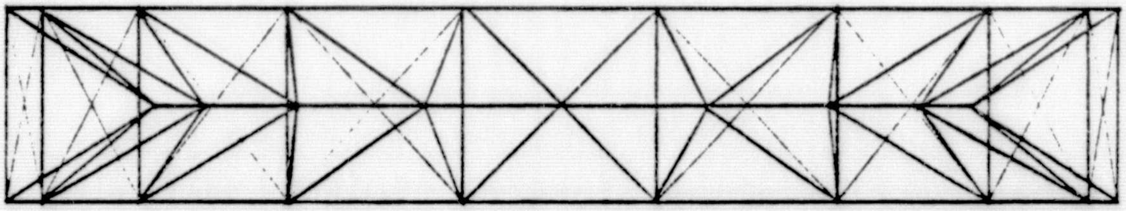

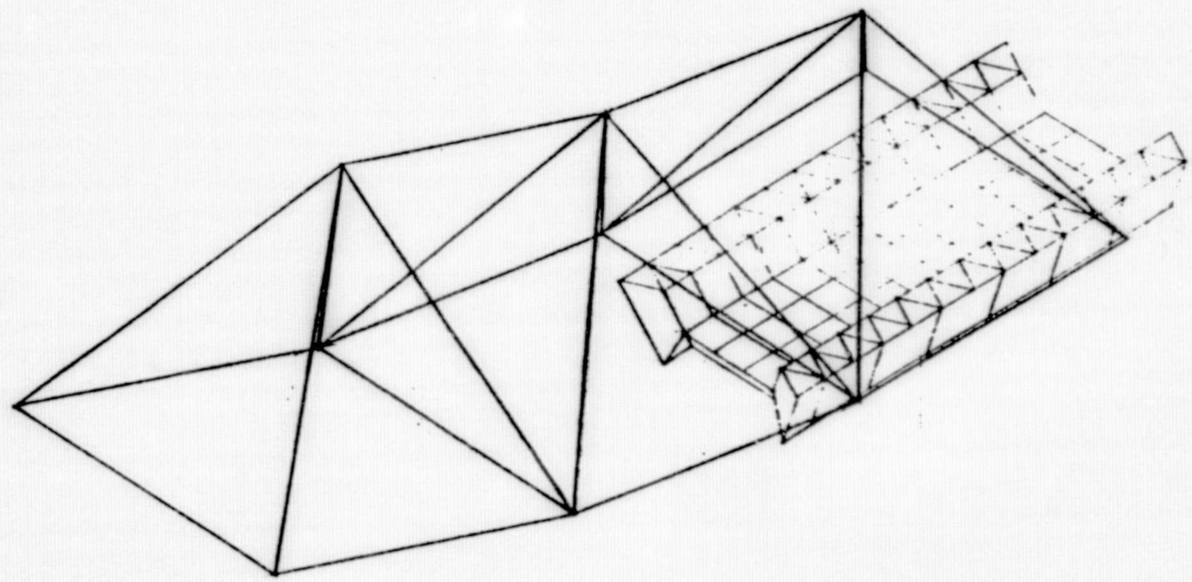

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[illegible] FCMOUT

START 0

   REVISION NINE  (15 FEBRUARY 1982)

[illegible] PASSIVE MICROWAVE RADIOMETER (SS TEST HARDWARE)
[illegible]WRAP 10 95 130 50 120 60 30 15
[illegible]ENGIE 0 0
[illegible]SUPPORT 1.0 .3 1 1
[illegible]SUPPORT 1 .2 1 1 1
WEIGHT 0 0 30 4400
SCHEDULE 0 0
FINAL 1 0
FLIGHT 0 0
TOOLING 1
SPARES 10
SETS 1
CLASS 0
DEV

          ***  FCM MODEL REVISION NINE         24 FEB 1983  ***

*********************************************************************
ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
*********************************************************************

                                        *********** BOEING ***********   SUB/GFE
                                        DESIGN   DEV SHOP   DES & SHOP    TOTAL
                                        HOURS     HOURS      DOLLARS     DOLLARS
                                        ------   --------  ----------   -------
[illegible]  STRUCTURE
[illegible]  TRUSS STRUCTURE 4390 5 1.2 1 0 50
                                        214720.    64416.   14002668.
[illegible] INTEG & TEST 0 5 0 0
                                         33320.     9996.    2148848.
[illegible]  ELECTRICAL SYSTEM
[illegible]  RECEIVER 10 5 1 0 60
                                          2727.      818.     241329.
[illegible] INTEG & TEST 0 5 0 0
                                           477.      143.      42220.
[illegible]
MFG
          ***  FCM MODEL REVISION NINE         [illegible]  ***

*********************************************************************
MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
*********************************************************************

                                        *********** BOEING ***********   SUB/GFE
                                        B.F.L.      Q.C.   MANUFACTUR     TOTAL
                                        HOURS      HOURS    DOLLARS      DOLLARS
                                        ------    ------  ----------    -------
[illegible]  STRUCTURE
[illegible]  TRUSS STRUCTURE 4390 5 3 0 50
                                        133462.    23019.   21101008.
MAC ASSY & C/O 0 5 0 0
                                         14063.     2109.    1933681.
[illegible]  ELECTRICAL SYSTEM
[illegible]  RECEIVER 10 5 3 0 60
                                          3449.      517.     474264.
[illegible] ASSY & C/O 0 5 0 0
                                           381.       57.      52345.
END
          ***  FCM MODEL REVISION NINE         24 FEB 1983  ***

*********************************************************************
*** BOEING*BOEING **  FCM  HOURS SUMMARY HOURS  FCM  ** BOEING*BOEING ****
*********************************************************************

 TITLE:  PASSIVE MICROWAVE RADIOMETER (SS TEST HARDWARE)
 ---------------------------------------------------------------
          BOEING HARDWARE SUBSYSTEM HOURS
                                      DESIGN    DEV SHOP     B.F.L.      Q.C.
                                   ----------
 [illegible]  STRUCTURE               [illegible]
 [illegible]  ELECTRICAL SYSTEM       [illegible]
                                   ----------
          BOEING SUBTOTAL             [illegible]

                                      HARDWARE [illegible]
```

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	[illegible]
SOFTWARE ENGINEERING	[illegible]
SYSTEMS GROUND TEST CONDUCT	96365
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	39127
SUPPORT EQUIPMENT MFG	27422
TOOLING & SPECIAL TEST EQUIPMENT	13328
SPARES	19706
LIAISON ENGINEERING	18064
DATA	35867
PROGRAM MANAGEMENT (ENG)	94177
PROGRAM MANAGEMENT (MFG)	50869

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	326600
BOEING HARDWARE SFL & QC HOURS	226600
BOEING SUPPORT HOURS	468800
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	1022100

*** PCM MODEL REVISION NINE 24 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: PASSIVE MICROWAVE RADIOMETER (SS TEST HARDWARE)

	--DEVELOPMENTAL-- ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
61 STRUCTURE	21.952	23.035
62 ELECTRICAL SYSTEM	0.284	0.527
SUBSYSTEM HARDWARE SUBTOTAL ($M)	22.235	23.561
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (31-650) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		3.534
HARDWARE SUBTOTAL ($M)		27.095
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	3.497	
SOFTWARE ENGINEERING	1.265	
SYSTEMS GROUND TEST CONDUCT	7.372	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	2.738	2.861
TOOLING & SPECIAL TEST EQUIPMENT		1.599
SPARES		2.336
LIAISON ENGINEERING	1.084	
DATA	[illegible]	
PROGRAM MANAGEMENT	6.781	3.052
SUPPORT EFFORT SUBTOTAL ($M)	24.707	9.869
TOTAL ($M) (NOMINAL SCHEDULE)	47.144	36.965

PAYLOAD ELEMENT NAME
ZERO-G BROMINE PHASE SEPARATION

CODE
BACX2006

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 11

CONTACT
Name DALE STALNAKER
Address LEWIS RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 5

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1999 Number of Flights 1 Duration of Flight, Days 180

OBJECTIVE
TO STUDY AND DEMONSTRATE THE HOMOGENIZATION AND PHASE SEPARATION OF POLYBROMIDE COMPLEX AND HYDROGEN GAS FROM AN AQUEOUS BROMIDE SOLUTION IN A WEIGHTLESS ENVIRONMENT. THE INFORMATION WILL BE USEFUL FOR DESIGNING ZINC BROMINE FLOW BATTERIES AND HYDROGEN BROMINE FUEL CELLS FOR SPACE APPLICATIONS

DESCRIPTION
HYDROBROMIC ACID, POLYBROMIDE COMPLEX, AND HYDROGEN GAS ARE MIXED INTO A SINGLE HOMOGENOUS STREAM AND CIRCULATED THROUGH TEST CELLS TO SIMULATE FLOW-BY AND FLOW-THROUGH ELECTRODES. VARIOUS MIXING CONDITIONS WILL ALSO BE SIMULATED. THE TWO LIQUID PHASES AND THE GAS PHASE ARE THEN SEPARATED INTO THREE DISTINCT PHASES BY A CENTRIFUGE. THE LIQUIDS ARE RECYCLED TO BE MIXED AGAIN. THE SIZE AND QUANTITY OF GAS AND POLYBROMIDE PARTICLES IN THE ELECTROLYTE ARE TO BE MONITORED AT THE INLETS AND OUTLETS OF THE MIXERS AND THE CENTRIFUGE.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	500	
Standby		( ) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime (X) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized

L, m: .70	W, m: .30	H, m: .40	Stowed
L, m: .70	W, m: .30	H, m: .40	Deployed

Launch mass, kg: 113 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 1

Task Assignments

Skills (See Table B)

Skill	3						
Level	3						
Hours/Day							

EVA (X) Yes ( ) No Reason TEST Hours/EVA 300

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	180 days/year
IVA Service	15 man-days/year
EVA Service	4 man-days/year
Experiment Ops	100 man-days/year
Service Frequency	1 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:		meters	Width:	meters	Height:		meters	(Stowed)
Length:		meters	Width:	meters	Height:		meters	(Deployed)
Mass:		kg						

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 1

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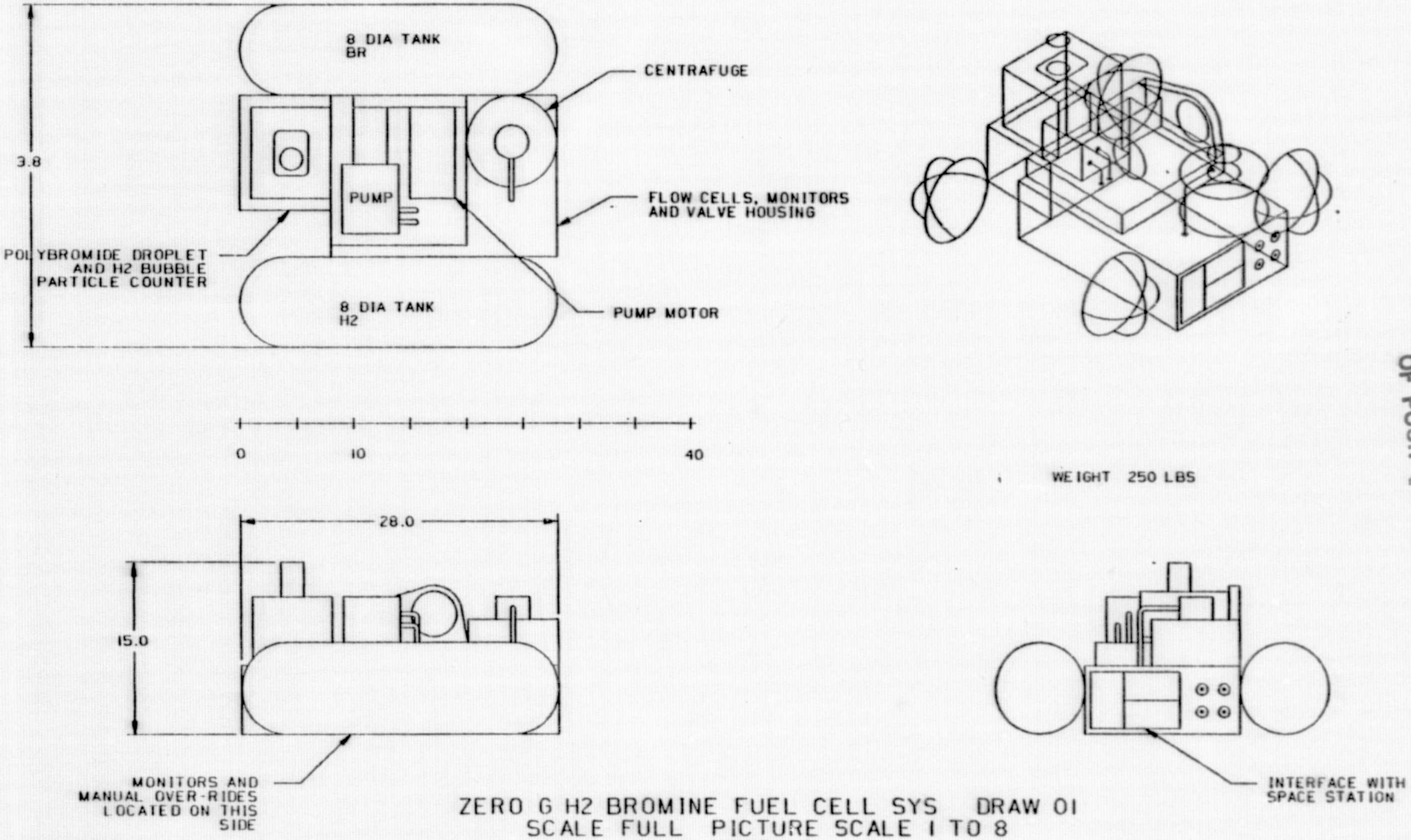

ZERO G H2 BROMINE FUEL CELL SYS DRAW 01
SCALE FULL PICTURE SCALE 1 TO 8
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TY SPACES PCMOUT

START 5

   REVISION NINE  (15 FEBRUARY 1982)

CASE SPACE STATION HARDWARE (DEV)
DWRAP 60 75 130 50 120 60 30 15
REMOTE 0 0
ASUPPORT 1 .3 1 .5
BSUPPORT .5 1 1 1 1
WEIGHT 0 0 5 7920
SCHEDULE 0 0
FINAL 1 0
FLIGHT 0 0
TOOLING .2
SPARES 10
SETS 1
CLASS 0
MILL 1
DEV
          ***  PCM MODEL REVISION NINE        18 FEB 1983  ***

***************************************************************************
ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
***************************************************************************


   $$$$$$$$$$  MILLIONS  $$$$$$$$$$   ********** BOEING **********   SUB/GFE
                                      DESIGN  DEV SHOP  DES & SHOP    TOTAL
                                       HOURS    HOURS     DOLLARS   . DOLLARS
                                      ------  --------  ----------   -------
D3  LIQUID DROPLET RADIATOR
M2  HEAT EXCHANGER 5060 4 0 0
                                      96140.    28842.       8.508
M7  DROPLET GENERATOR-STRUCTURE 660 4 0 0
                                      57327.    17198.       5.073
M2  DROPLET GENERATOR 1540 5 0 0
                                      34145.    10243.       3.022
M4  PIPING 440 3 0 0
                                       4059.     1218.       0.359
M2  COLLECTOR 220 4 0 0
                                       5457.     1637.       0.483
MIT INTEGRATION & TEST 0 4 0 0
                                      25394.     7618.       2.247
END
MES

          ***  PCM MODEL REVISION NINE        18 FEB 1983  ***

***************************************************************************
MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
***************************************************************************


   $$$$$$$$$$  MILLIONS  $$$$$$$$$$   ********** BOEING **********   SUB/GFE
                                      S.F.L.     Q.C.  MANUFACTUR     TOTAL
                                       HOURS    HOURS     DOLLARS    DOLLARS
                                      ------   ------  ----------    -------
B3  LIQUID DROPLET RADIATOR
M2  HEAT EXCHANGER 5060 5  3 0 0
                                      75655.    11348.      10.403
M7  DROPLET GENERATOR-STRUCTURE 660 4 3 0 0
                                      26092.     3914.       3.588
M2  DROPLET GENERATOR 1540 5  3 0 0
                                      27655.     4148.       3.803
M4  PIPING 440 3  3 0 0
                                       7307.     1096.       1.005
M2  COLLECTOR 220 4 3 0 0
                                       4861.      729.       0.668
MAC HARDWARE ASSEMBLY & CHECKOUT 0 4 0 0
                                      10025.     1504.       1.378
END
          ***  PCM MODEL REVISION NINE        18 FEB 1983  ***

***************************************************************************
*** BOEING*BOEING **   PCM  HOURS SUMMARY HOURS  PCM    ** BOEING*BOEING ****
***************************************************************************

TITLE:  SPACE STATION HARDWARE (DEV)
```

END

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

*** BOEING*BOEING ** PCM HOURS SUMMARY HOURS PCM ** BOEING*BOEING ****

TITLE: SPACE STATION HARDWARE (DEV)

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	B.F.L.	Q.C.
33 LIQUID DROPLET RADIATOR	222521	66756	151595	22739
BOEING SUBTOTAL	222521	66756	151595	22739

HARDWARE ASSEMBLY & C/O 26150

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	37606
SOFTWARE ENGINEERING	9783
SYSTEMS GROUND TEST CONDUCT	46957
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	9722
SUPPORT EQUIPMENT MFG	7360
TOOLING & SPECIAL TEST EQUIPMENT	20920
SPARES	17433
LIAISON ENGINEERING	15981
DATA	19996
PROGRAM MANAGEMENT (ENG)	68080
PROGRAM MANAGEMENT (MFG)	44001

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	289200
BOEING HARDWARE BFL & QC HOURS	200500
BOEING SUPPORT HOURS	297800
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	787600

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: SPACE STATION HARDWARE (DEV)

	--DEVELOPMENTAL--	
	ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
33 LIQUID DROPLET RADIATOR	19.693	20.844
SUBSYSTEM HARDWARE SUBTOTAL ($M)	19.693	20.844
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (S1-S50) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		3.127
HARDWARE SUBTOTAL ($M)		23.971
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	2.256	
SOFTWARE ENGINEERING	0.792	
SYSTEMS GROUND TEST CONDUCT	3.592	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.685	0.768
TOOLING & SPECIAL TEST EQUIPMENT		2.510
SPARES		2.084
LIAISON ENGINEERING	0.957	
DATA	1.200	
PROGRAM MANAGEMENT	4.902	2.640
SUPPORT EFFORT SUBTOTAL ($M)	14.387	8.003
TOTAL ($M) (NOMINAL SCHEDULE)	34.080	31.974

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PAYLOAD ELEMENT NAME
SPACE COMPONENT LIFETIME TECH

CODE
BACX2009

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name DAVID ENNIS
Address AMES RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 7

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1996 Number of Flights 1 Duration of Flight, Days 720

OBJECTIVE
TO PROVIDE A TECHNOLOGY BASE FOR THE DEVELOPMENT OF DIVERSE HARDWARE COMPONENTS FOR WHICH A MULTI-YEAR OPERATIONAL LIFETIME UNDER SPACE CONDITIONS IS SPECIFIED.

DESCRIPTION
THE PROPOSED MISSION WOULD CHARACTERIZE THE PERFORMANCE LIFETIME OF CRITICAL COMPONENTS SELECTED FROM VARIED SPACE TECHNOLOGIES. COMPONENTS REQUIRING EVALUATION IN THE SPACE ENVIRONMENT INCLUDE PRIMARY PROPULSION SYSTEMS; SOLAR CELL AND CHEMICAL BATTERY POWER UNITS; SPACE QUALIFIED SOLID FILM LUBRICANTS; LASER AND CONVENTIONAL SPIN GYROS; MICROWAVE AMPLIFIER CATHODS; AND SPACE SUITS.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0
Heat Rejection, w Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: .50 W, m: .50 H, m: .50 Stowed
L, m: .50 W, m: .50 H, m: .50 Deployed
Launch mass, kg: 45 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0

Task Assignments

Skills (See Table B)

Skill	9	11	13			
Level	1	1	1			
Hours/Day						

EVA (X) Yes ( ) No Reason TEST COMPONENTS Hours/EVA 60

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer
- ( ) Not Serviced — F
- ( ) Remote TMS — FT
- ( ) Remote Manned — FM
- ( ) Serviced at Station (TMS Retrieved) — FST
- ( ) Serviced at Station (Self-propelled) — FS

Platform Based
- ( ) Not Serviced — P
- ( ) Remote TMS — PT
- ( ) Remote Manned — PM
- ( ) Serviced at Station (TMS Retrieved) — PST
- ( ) Serviced at Station (Self-propelled) — PS

Other
- ( ) Space Station Based — SS
- (X) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY
- (X) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	0	days
OTV or TMS on Orbit	0	days
Mission Use	365	days/year
IVA Service	10	man-days/year
EVA Service	10	man-days/year
Experiment Ops	20	man-days/year
Service Frequency	12	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stowed)
Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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— — — PRICE 84 — — —
ELECTRONIC ITEM

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SPACE COMPONENT TECH LAB EQUIPMENT

		UNIT WEIGHT	100.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	6.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	147.	-	147.
DESIGN	349.	-	349.
SYSTEMS	19.	-	19.
PROJECT MGMT	1141.	-	1141.
DATA	120.	-	120.
SUBTOTAL(ENG)	1776.	-	1776.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	3997.	-	3997.
TOOL-TEST EQ	1367.	-	1367.
SUBTOTAL(MFG)	5364.	-	5364.
TOTAL COST	7140.	-	7140.

PAYLOAD ELEMENT NAME
LIQUID DROPLET RADIATOR

CODE
BACX2011

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 16

CONTACT
Name THEODORE MROZ
Address NASA-LEWIS RESEARCH CENTER

Telephone 216 433-4000 X67

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 5

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 2005 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
DEMONSTRATION AND TECHNICAL VERIFICATION OF AN ADVANCED LIQUID DROPLET SPACE RADIATOR CONCEPT UNDER ACUTAL OPERATIONAL SPACE STATION CONDITIONS (ZERO-GRAVITY, SPACE VACUUM, SPACE PLASMA, ATTITUDE CONTROL MANEUVERING PERTURBATION, ETC., DURING LONG DURATION OPERATIONS). DETERMINE OPERATIONAL CHARACTERISTICS, CONSTRAINTS AND EFFECTS OF SPACE STATION/ RADIATOR INTERFACE.

DESCRIPTION
THE CANDIDATE LIQUID DROPLET RADIATOR SYSTEMS COULD BE INTEGRATED/CONNECTED TO THE SPACE STATION THERMAL MANAGEMENT SYSTEM AT THE HEAT REJECTION INTERFACE POINT. THE SYSTEM ASSEMBLY WOULD BE INSTALLED AS AN AUXILLIARY EXPERIMENTAL HEAT REJECTION SYSTEM. WASTE HEAT LOAD WOULD BE SUPPLIED BY THE SPACE STATION (AS AN OPTION A SEPARATE HEAT SOURCE COULD BE USED) COMMENSURATE TO THE SIZE OF THE LIQUID DROPLET RADIATOR SYSTEM. IT WOULD OPERATE AT ACTUAL SPACE STATION RADIATOR CONDITIONS OF INLET AND OUTLET TEMPERATURE, ZERO GRAVITY, VACUUM, SOLAR RADIATION, ATTITUDE CORRECTION AND MANEUVERING PERTURBATIONS AND WITH THE NTERFACE OF SPACE PLASMA. PERFORMANCE WOULD BE EVALUATED FOR EFFICIENCY OF WASTE HEAT REJECTION, RESPONSE, TEMPERATURE DISTRIBUTION CONTROLABILITY, FLOW RATE, POTENTIAL OF LOSS OF WORKING FLUID AND SPACE STATION CONTAMINATION DUE TO VAPORIZATION AND MANUEVERING AND EFFECT OF SPACE PLASMA INTERFACE ON LIQUID DROPLET GENERATION, TRAJECTORY A

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction (X) Inertial ( ) Solar ( ) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	1000	24.00
Standby		
Peak		

(X) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime (X) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz): 0.00
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
L, m: 10.00 W, m: .50 H, m: 5. Stowed
L, m: 10.0 W, m: .50 H, m: 15. Deployed
Launch mass, kg: 3600 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 3

Skills (See Table B)

Task Assignments

Skill	11	12	13			
Level	3	3	3			
Hours/Day						

EVA (X) Yes ( ) No Reason INSTALLATION Hours/EVA 16.00

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

ORIGINAL PAGE IS
OF POOR QUALITY

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0	days
OTV or TMS on Orbit	0	days
Mission Use	365	days/year
IVA Service	10	man-days/year
EVA Service	20	man-days/year
Experiment Ops	20	man-days/year
Service Frequency	6	times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	1	meters	Width:	.5	meters	Height:	.5	meters	(Stowed)
Length:	3	meters	Width:	1	meters	Height:	1	meters	(Deployed)

Mass: 500 kg

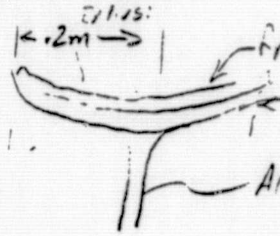
Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 2

MASS 1000 kg
(... start at 300 kg)

- piezoelectric vibrator - small, 1 hp
- fluid pump to pressurize fluid - low pressure
- fluid - 1 part, $70,
- pressure sensors, flow meters, control valves

Collector



.2m

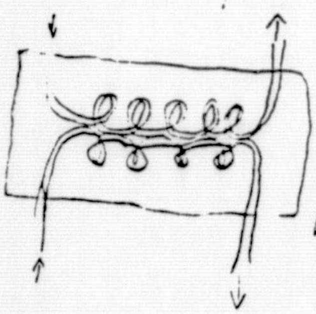
fritted glass - $10/cm²

MASS = 100 kg

Aluminum mandrel - low Design complexity ≈ 2

Aluminum tubing

to heat exchanger



MASS: 2300 kg
Design complexity = 4-5
Volume: 1.5 m³

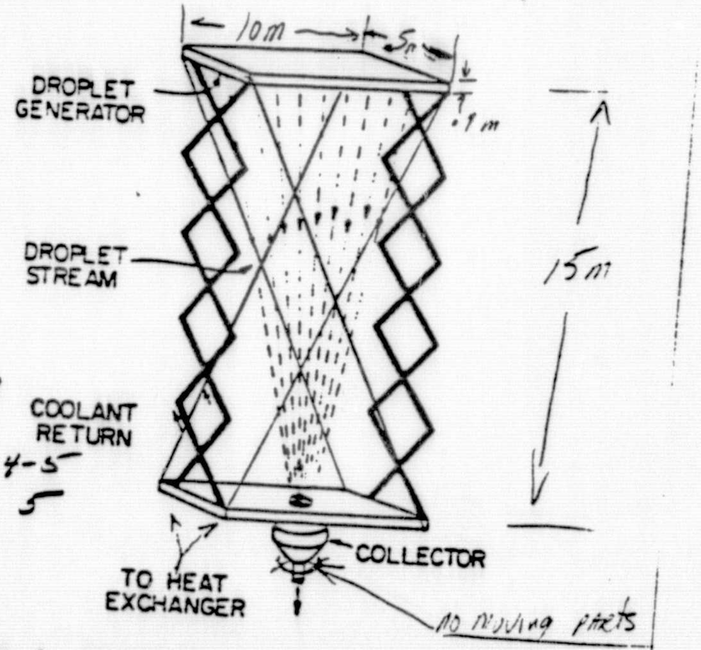


Fig. 8. Retractable Liquid Droplet Radiator.

Piping - MASS = ~~800~~ kg
200

1000
2300
200

```
TY SPACES PCMOUT

 START 5

    REVISION NINE  (15 FEBRUARY 1982)

 CASE H2-BROMINE FUEL CELL SYSTEM--SPACE TEST HARDWARE
 DWRAP 60 95 130 50 120 60 30 15
 REMOTE 0 0
 ASUPPORT 1 .3 1 .3
 BSUPPORT .3 1 1 1 1
 WEIGHT 0 0 90 250
 SCHEDULE 0 0
 FINAL 1 0
 FLIGHT 0 0
 TOOLING .2
 SPARES 10
 SETS 1
 CLASS 0
 MILL 1
 DEV
```

*** PCM MODEL REVISION NINE   18 FEB 1983 ***

```
****************************************************************************
ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
****************************************************************************
```

$$$$$$$$$$ MILLIONS $$$$$$$$$$	********** BOEING **********			SUB/GFE
	DESIGN HOURS	DEV SHOP HOURS	DES & SHOP DOLLARS	TOTAL DOLLARS
B1 TOTAL FUEL CELL SYSTEM				
M2 BUBBLE PARTICLE COUNTER 60 5 0 100	53.	16.	0.005	
M4 PUMP 15 5 0 90	44.	13.	0.004	
X3 PUMP MOTOR 15 5 0 90	1416.	423.	0.125	
M2 STRUCTURE 68 5 0 0	1966.	590.	0.174	
X3 CENTRIFUGE 15 5 0 90	1416.	425.	0.125	
M5 CENTRIFUGE 20 5 0 90	367.	110.	0.032	
M3 BROMINE TANK 35 5 0 90	110.	33.	0.010	
M3 H2 TANK 20 5 0 90	70.	21.	0.006	
B2 ELECTRONICS				
E4 ELECTRONICS 2 5 0 100	13.	4.	0.001	

```
END
MFG
```

*** PCM MODEL REVISION NINE   18 FEB 1983 ***

```
****************************************************************************
MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
****************************************************************************
```

$$$$$$$$$$ MILLIONS $$$$$$$$$$	********** BOEING **********			SUB/GFE
	B.F.L. HOURS	Q.C. HOURS	MANUFACTUR DOLLARS	TOTAL DOLLARS
B1 TOTAL FUEL CELL SYSTEM-STRUCTURE				
M2 BUBBLE PARTICLE COUNTER 60 5 3 0 100	1510.	226.	0.208	
M4 PUMP 15 5 3 0 90	477.	72.	0.066	
X3 PUMP MOTOR 15 5 3 0 90	1615.	242.	0.222	
M2 STRUCTURE 68 5 3 0 0	1974.	296.	0.271	
X3 CENTRIFUGE 15 5 3 0 90	1613.	242.	0.222	
M5 CENTRIFUGE 20 5 3 0 90	800.	120.	0.110	
M3 BROMINE TANK 35 5 3 0 90	983.	148.	0.135	
M3 H2 TANK 20 5 3 0 90				

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X3 PUMP MOTOR 15 5 3 0 90	1615.	242.	0.222
M2 STRUCTURE 68 5 3 0 0	1974.	[illegible]	0.271
X3 CENTRIFUGE 15 5 3 0 90	1615.	242.	0.222
M5 CENTRIFUGE 20 5 3 0 90	800.	120.	0.110
M3 BROMINE TANK 35 5 3 0 90	983.	148.	0.135
M3 H2 TANK 20 5 3 0 90	611.	92.	0.084
E2 ELECTRONICS			
E4 ELECTRONICS 2 5 3 0 100	628.	94.	0.086

END

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

*** BOEING*BOEING ** PCM HOURS SUMMARY HOURS PCM ** BOEING*BOEING ****

TITLE: H2-BROMINE FUEL CELL SYSTEM--SPACE TEST HARDWARE

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	B.F.L.	Q.C.
B1 TOTAL FUEL CELL SYSTEM-S	5448	1634	9586	1438
B2 ELECTRONICS	13	4	628	94
BOEING SUBTOTAL	5461	1638	10214	1532

HARDWARE ASSEMBLY & C/O 1762

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	5674
SOFTWARE ENGINEERING	1443
SYSTEMS GROUND TEST CONDUCT	3614
SYSTEMS FLIGHT TEST CONDUCT	
SUPPORT EQUIPMENT DESIGN	470
SUPPORT EQUIPMENT MFG	470
TOOLING & SPECIAL TEST EQUIPMENT	1477
SPARES	1175
LIAISON ENGINEERING	1077
DATA	2121
PROGRAM MANAGEMENT (ENG)	3362
PROGRAM MANAGEMENT (MFG)	2973

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	7000
BOEING HARDWARE BFL & QC HOURS	13500
BOEING SUPPORT HOURS	23900
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	44500

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: H2-BROMINE FUEL CELL SYSTEM--SPACE TEST HARDWARE

	--DEVELOPMENTAL--	
	ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
B1 TOTAL FUEL CELL SYSTEM-STRUC	0.482	1.318
B2 ELECTRONICS	0.001	0.086
SUBSYSTEM HARDWARE SUBTOTAL ($M)	0.483	1.404
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (31-850) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		0.211
HARDWARE SUBTOTAL ($M)		1.615
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	0.340	
SOFTWARE ENGINEERING	0.117	
SYSTEMS GROUND TEST CONDUCT	0.276	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.033	0.049
TOOLING & SPECIAL TEST EQUIPMENT		0.177
SPARES		0.140
LIAISON ENGINEERING	0.065	
DATA	0.127	
PROGRAM MANAGEMENT	[illegible]	0.173
SUPPORT EFFORT SUBTOTAL ($M)	1.201	0.540
TOTAL ($M) (NOMINAL SCHEDULE)	1.684	[illegible]

PAYLOAD ELEMENT NAME
ION THRUSTER EFFECT ON LEO POWER

CODE
BACX2012

CONTACT
Name CAROLYN PORVIS
Address NASA-LEWIS RESEARCH CENTER

Telephone 216 433-4000 X52

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 11

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 4

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1998   Number of Flights 1   Duration of Flight, Days 90

OBJECTIVE
TO OBTAIN ESSENTIAL KNOWLEDGE ON POWER SYSTEMS OPERATING IN AN ION THRUSTER GENERATED PLASMA PLUME WHICH IS NEEDED FOR DESIGN AND DEVELOPMENT OF ADVANCED PHOTOVOLTAIC SPACE POWER SYSTEM WITH HIGH POWER AND HIGH VOLTAGE.

DESCRIPTION
PROTOTYPE OF ADVANCED PHOTOVOLTAIC SPACE POWER SYSTEMS MUST BE OPERATED IN THE VICINITY OF AN ION THRUSTER IN ORDER TO GAIN ESSENTIAL EXPERIMENTAL DATA. THIS DATA WILL BE ANALYZED TO YIELD BASIC KNOWLEDGE ABOUT THE PHYSICAL PROCESSES AND ULTIMATELY VERIFICATION OF ANALYTICAL MODELS AND PRACTICAL POWER SYSTEM DESIGNS.
THE EFFECTS OF BOTH NATURAL PLASMA ENVIRONMENT AND ION ENGINE GENERATED PLASMA ENVIRONMENT MUST BE DETERMINED POWER LOSSES, ARRAY DEGRADATION AND ELECTROMAGNETIC INTERFERENCE ARE OF MAJOR CONCERN AND MUST BE CAREFULLY CONTROLLED. DATA MUST BE OBTAINED FOR A VARIETY OF THRUSTER PROPELLANTS AND USEFUL FOR ARRAY TYPE, SIZE AND VOLTAGE SCALING.
BOTH PLASMA AND CONCENTRATOR SOLAR ARRAYS MUST BE ANALYZED AND TESTED INCLUDING THE EFFECT OF MODIFICATIONS INCORPORATING MITIGATION TECHNIQUES SUCH AS INSULATING AND BIASING.

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial (X) Solar ( ) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime (X) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External (X) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
L, m: 1.00 W, m: 1.00 H, m: 1.00 Stowed
L, m: 1.00 W, m: 1.00 H, m: 1.00 Deployed
Launch mass, kg: 112 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill	12	13	14	7	8	9	10
Level	3	3	3	3	3	3	
Hours/Day							

EVA (X) Yes ( ) No Reason DEPLOYMENT Hours/EVA 120

SERVICING/MAINTENANCE
Service: Interval, days 90 Consumables, kg 100
Returnables, kg Man hours 8.00
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions
ONSIDER INTEGRATING THIS MISSION WITH BACX2008 (LARGE SOLAR CONCENTRATOR) TO CREATE A POWER SYSTEM,
ESEARCH PLATFORM. ALSO INCLUDE BACX2023 (SOLAR SUSTAINED PLASMA).

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer
- ( ) Not Serviced — F
- ( ) Remote TMS — FT
- ( ) Remote Manned — FM
- ( ) Serviced at Station (TMS Retrieved) — FST
- (X) Serviced at Station (Self-propelled) — FS

Platform Based
- ( ) Not Serviced — P
- ( ) Remote TMS — PT
- ( ) Remote Manned — PM
- ( ) Serviced at Station (TMS Retrieved) — PST
- ( ) Serviced at Station (Self-propelled) — PS

Other
- ( ) Space Station Based — SS
- ( ) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- (X) Medium
- ( ) High

Operations Times

OTV Up/Down	0	days
OTV or TMS on Orbit	0	days
Mission Use	90	days/year
IVA Service	2	man-days/year
EVA Service	20	man-days/year
Experiment Ops	30	man-days/year
Service Frequency	3	times/year

Delta Velocities
- Up
- Down
- Aero Return

Support Equipment

Length:	3	meters	Width:	.5	meters	Height:	.5	meters	(Stowed)
Length:	12	meters	Width:	.1	meters	Height:	.1	meters	(Deployed)

Mass: 200 kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab
Number of Appendages 2
Number of Modules Required to Assemble the Payload 2

ION THRUSTER EFFECT ON LEO POWER   2012

EVA

Lock Ion thruster

Activate lights

Activate remote TV

Survey work area with RTV

Gather tools

Assemble solar array

Mount solar array near ion thruster

Cable up solar array

Record power output measurements for solar array

Activate recording devices

Stow tools

Deactivate RTV

Deactivate lights

- - - TABLE 24 - - -
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:39 (283010) FILENAME: REI22.DAT

ION THRUSTER EFFECT ON LEO POWER

PROTOTYPE QUANTITY	3.000	UNIT WEIGHT	250.00	MODE	1
		UNIT VOLUME	27.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	371.	-	371.
DESIGN	1208.	-	1208.
SYSTEMS	220.	-	220.
PROJECT MGMT	698.	-	698.
DATA	81.	-	81.
SUBTOTAL(ENG)	2578.	-	2578.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	1272.	-	1272.
TOOL-TEST EQ	740.	-	740.
SUBTOTAL(MFG)	2012.	-	2012.
TOTAL COST	4589.	-	4589.

DESIGN FACTORS	ELECTRONIC	MECHANICAL	PRODUCT DESCRIPTORS	
WEIGHT	5.000*	245.000	ENGINEERING COMPLEXITY	0.800
DENSITY	42.300	9.074*	PROTOTYPE SUPPORT	1.0
MFG. COMPLEXITY	10.357	7.133	PROTO SCHEDULE FACTOR	.250*
NEW DESIGN	0.100	0.700	ELECT VOL FRACTION	.004*
DESIGN REPEAT	0.000	0.000	PLATFORM	2.500
EQUIPMENT CLASS	*****	*****	YEAR OF TECHNOLOGY	1987*
INTEGRATION LEVEL	0.0	0.0	RELIABILITY FACTOR	1.0
			HIGH(FIELD)	[illegible]

SCHEDULE	START		FIRST ITEM		FINISH	
DEVELOPMENT	JAN 87	(11)	NOV 87*	([illegible])	SEP 88*	(21)

SUPPLEMENTAL INFORMATION

YEAR OF ECONOMICS	1984	TOOLING & [illegible] FACTORS	
ESCALATION	0.00	DEVELOPMENT TOOLING	3.00
DEV COST MULTIPLIER	1.14		

COST RANGES	DEVELOPMENT	PRODUCTION	TOTAL COST
FROM	4019.		4019.
CENTER	4589.		4589.
TO	5266.		5266.

[illegible]

PAYLOAD ELEMENT NAME
CREW SYSTEMS-EMESIS STATION

CODE
BACX2013

CONTACT
Name RICHARD KENNEDY
Address JOHNSON SPACE CENTER

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1992 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
TO PROVIDE THE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF THE SYSTEM REQUIRED FOR EMESIS COLLECTION, FACE WASH, AND CLEANUP.

DESCRIPTION
BY PROVISIONING THE INITIAL CONFIGURATION WITH AN EMESIS STATION, THIS MISSION WILL PROVIDE FOR DIRECT CREW INVOLVEMENT WITH THE SYSTEM IN THE ACTUAL OPERATING ENVIRONMENT. OPERATION BY THE CREW WILL BE UNDER SIMULATED CONDITIONS OR, IF REQUIRED, UNDER ACTUAL EMESIS CIRCUMSTANCES.

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	200	0.5
Standby		
Peak		

( ) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
(X) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location (X) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 1.00 W, m: 0.50 H, m: 0.50 Stowed
L, m: 1.00 W, m: 0.50 H, m: 0.50 Deployed
Launch mass, kg: 100 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size Task Assignments

Skills (See Table B)

Skill	11						
Level	2						
Hours/Day							

EVA ( ) Yes (X) No Reason Hours/EVA

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

ORIGINAL PAGE IS OF POOR QUALITY

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	365 days/year
IVA Service	4 man-days/year
EVA Service	man-days/year
Experiment Ops	2 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

Cost Data

Name and Phone Number: C. REID 3-2020

DESCRIPTION
BY PROVISIONING THE INITIAL CONFIGURATION WITH AN EMESIS STATION, THIS MISSION WILL PROVIDE FOR DIRECT CREW INVOLVEMENT WITH THE SYSTEM IN THE ACTUAL OPERATING ENVIRONMENT. OPERATION BY THE CREW WILL BE UNDER SIMULATED CONDITIONS OR, IF REQUIRED, UNDER ACTUAL EMESIS CIRCUMSTANCES.

Item Dry Weight: 152 pounds   Volume: 12.00 cubic feet

Structural Weight (includes typical "mechanical" items listed below): 140.00 pounds

Design Complexity: 8

Manufacturing Complexity for Structural/Mechanical Items: 5
Typical "mechanical" items include enclosures, optics, motors, blowers, gyros, batteries, cables, connectors, switches, indicators, cathode ray tubes, antennas without electronics, mechanisms, waveguides, etc.

Electronic Equipment Description:

Analog	10 %
Digital	20 %
Power Supplies	60 %
Other	10 %

Manufacturing Complexity for Electronic Items: 5

Weight of the Circuit Board and Electronics Mounted on it: 4.00 pounds

Material Used for the Enclosure: STAINLESS   Machine Casting? No

Of the electronics weight, what % is off-the-shelf? 0

Of the sturctural weight, what % is off-the-shelf? 0

Manufacturing Degree of Automation

Electronics	( ) Low	(X) Medium	( ) High
Mechanical	( ) Low	(X) Medium	( ) High

Is the item Hardened? No

PAYLOAD ELEMENT NAME
DISHWASHER/CLOTHES WASHER

CODE
BACX2014

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name RICHARD KENNEDY
Address JOHNSON SPACE CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1991 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
TO TEST DISHWASHER/CLOTHESWASHER OPTIONS PRIOR TO PERMANENT INSTALLATION IN SPACE STATION.

DESCRIPTION
THIS MISSION WILL PROVIDE THE CONDITIONS NECESSARY FOR THE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF APPLIANCES REQUIRED TO CLEANSE EATING APPARATUS AND CREW APPAREL. THIS MISSION CAN BE ACCOMMODATED ON THE INITIAL SPACE STATION CONFIGURATION WITH THE TECHNOLOGY TRANSFERRABLE TO THE EVOLUTIONARY GROWTH CONFIGURATION.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	500	2.00
Standby		
Peak		

( ) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
(X) None   ( ) Realtime   ( ) Offline   ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS):   Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital   Hours/Day
Film (Amount):   Voice (Hours/Day):
Live TV (Hours/Day):   Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit)   Downlink command rate:
Recording Rate (KBPS)   Downlink Frequency (MHz):

THERMAL
( ) Active   (X) Passive
Temperature, deg C   Operational Minimum   Maximum
Non-operational Minimum   Maximum
Heat Rejection, w   Operational Minimum   Maximum
Non-operational Minimum   Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location   (X) Internal   ( ) External   ( ) Remote
Equipment ID/Function   (X) Pressurized   ( ) Unpressurized
L, m: 1.00   W, m: 1.00   H, m: 1.00   Stowed
L, m: 1.00   W, m: 1.00   H, m: 1.00   Deployed
Launch mass, kg: 100   Return mass, kg: 100
Consumable Types
Acceleration Sensitivity, (g)   min: 0.00E+00   max: 0.00E+00

CREW REQUIREMENTS
Crew Size   Task Assignments

Skills (See Table B)

Skill	11					
Level	2					
Hours/Day						

EVA ( ) Yes (X) No   Reason   Hours/EVA

SERVICING/MAINTENANCE
Service: Interval, days   Consumables, kg
Returnables, kg   Man hours
Configuration Changes: Interval, day   Man/Hours Required
Deliverables, kg   Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	365 days/year
IVA Service	4 man-days/year
EVA Service	0 man-days/year
Experiment Ops	24 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length: meters	Width: meters	Height: meters	(Stowed)
Length: meters	Width: meters	Height: meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

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Cost Data

Name and Phone Number: G. REID 3-2020

DESCRIPTION
THIS MISSION WILL PROVIDE THE CONDITIONS NECESSARY FOR THE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF APPLIANCES REQUIRED TO CLEANSE EATING APPARATUS AND CREW APPAREL. THIS MISSION CAN BE ACCOMMODATED ON THE INITIAL SPACE STATION CONFIGURATION WITH THE TECHNOLOGY TRANSFERRABLE TO THE EVOLUTIONARY GROWTH CONFIGURATION.

Item Dry Weight: 400 pounds Volume: 20.00 cubic feet

Structural Weight (includes typical "mechanical" items listed below): pounds

Design Complexity: 4

Manufacturing Complexity for Structural/Mechanical Items: 4
Typical "mechanical" items include enclosures, optics, motors, blowers, gyros, batteries, cables, connectors, switches, indicators, cathode ray tubes, antennas without electronics, mechanisms, waveguides, etc.

Electronic Equipment Description:

Analog	10	%
Digital		%
Power Supplies	90	%
Other		%

Manufacturing Complexity for Electronic Items: 4

Weight of the Circuit Board and Electronics Mounted on it: 1.00 pounds

Material Used for the Enclosure: STAINLESS Machine Casting? NO

Of the electronics weight, what % is off-the-shelf? 75

Of the sturctural weight, what % is off-the-shelf? 50

Manufacturing Degree of Automation

Electronics	( ) Low	(X) Medium	( ) High
Mechanical	( ) Low	(X) Medium	( ) High

Is the item Hardened? No

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- - - PRICE 84 - - -
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:47 FILENAME: REID.DAT
(283010)

DISHWASHER/CLOTHES WASHER

		UNIT WEIGHT	400.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	20.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	149.	-	149.
DESIGN	454.	-	454.
SYSTEMS	54.	-	54.
PROJECT MGMT	310.	-	310.
DATA	36.	-	36.
SUBTOTAL(ENG)	1003.	-	1003.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	543.	-	543.
TOOL-TEST EQ	339.	-	339.
SUBTOTAL(MFG)	882.	-	882.
TOTAL COST	1885.	-	1885.

PAYLOAD ELEMENT NAME
FIRE SAFETY TECHNOLOGY

CODE
BACX2018

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name THOMAS LABUS
Address NASA-LEWIS RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 9

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1995 Number of Flights 1 Duration of Flight, Days 90

OBJECTIVE
TO PROVIDE THE TECHNOLOGY BASE FOR THE EXTINGUISHMENT OF FIRES AND FOR THE CONTROL OF COMBUSTION PROCESSES UNDER LOW GRAVITY.

DESCRIPTION
THIS MISSION WILL PROVIDE THE BASE TECHNOLOGY REQUIRED FOR THE EXTINGUISHMENT OF FIRES AND FOR THE CONTROL OF COMBUSTION PROCESSES IN CONFINED ENVIRONMENTS. IN-SPACE COMBUSTION TECHNOLOGY EXPERIMENTS INVOLVE THE INTERACTION BETWEEN A NUMBER OF COMPLEX PHYSICAL DISCIPLINES SUCH AS HEAT TRANSFER, FLUID MECHANICS, MASS TRANSFER AND CHEMICAL KINETICS. SPECIFIC TECHNOLOGY EXPERIMENTS TO DETERMINE THE EFFECTS OF LOW-GRAVITY SHOULD BE CONDUCTED TO DETERMINE THE COMBUSTION MECHANISMS OF SOLID, LIQUID AND GASEOUS SYSTEMS.
MANY POTENTIAL SPACE STATION EXPERIMENTS CAN BE CONDUCTED IN THE AREA OF FIRE SAFETY TECHNOLOGY. THESE MISSIONS COULD SUBSTANTIALLY BENEFIT FROM A MANNED TECHNOLOGY DEVELOPMENT LABORATORY FOR THEIR SUCCESSFUL CONDUCT.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	500	8.00	
Standby	50	16.00	( ) Continuous
Peak			

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
(X) On-Board Data Processing Required
Description:
Data Types: ( ) Analog (X) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0
Heat Rejection, w Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
L, m: 7.00 W, m: 4.00 H, m: 3.00 Stowed
L, m: 7.00 W, m: 4.00 H, m: 3.00 Deployed
Launch mass, kg: 250 Return mass, kg: 250
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 1 Task Assignments

Skills (See Table B)

Skill	3						
Level	3						
Hours/Day	4						

EVA (X) Yes ( ) No Reason CONDUCT EXPERIMENT Hours/EVA 540

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	90 days/year
IVA Service	5 man-days/year
EVA Service	90 man-days/year
Experiment Ops	90 man-days/year
Service Frequency	2 times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stowed)
Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	1

FIRE SAFETY TECHNOLOGY 2018

EVA

Activate lights

Activate remote TV

Scan work area with RTV

Gather tools and supplies

Translate to fire safety pallet

Turn on fire safety electronics and TV

Verify electronics and TV operational

Place sample in container

- Solid
- Liquid
- Gaseous

Conduct experiment

Check data

Stow tools and samples

Scan work area with RTV

Deactivate RTV

Deactivate lights

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TY SPACE13 PCMOUT

START 5

   REVISION NINE  (15 FEBRUARY 1982)

BASE FIRE SAFETY
DURAF 60 95 130 50 120 60 30 15
REMOTE 0 0
ASUPPORT 1 .3 1 1
ISUPPORT 1 .2 1 1 1
WEIGHT 0 0 35 354
SCHEDULE 0 0
FINAL 1 0
FLIGHT 0 0
TOOLING 1
SPARES 10
SETS 1
CLASS 0
DEV

           ***  PCM MODEL REVISION NINE        24 FEB 1983  ***

*************************************************************************
ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
*************************************************************************


                                      *********** BOEING ***********   SUB/GFE
                                      DESIGN  DEV SHOP   DES & SHOP    TOTAL
                                      HOURS    HOURS      DOLLARS     DOLLARS
                                      ------  --------  ----------   -------
B1  STRUCTURE
M6  TANKS 125 4 1 0 80
                                       3199.      960.     283101.
M7  CRADLE STRUCTURE 200 4 1 0 80
                                       4649.     1395.     411430.
M4  PLUMBING 50 4 1 0 50
                                        403.      121.      35674.
E3  CABLING 25 4 1 0 80
                                        348.      105.      30828.
E6  SENSORS 29 4 1 0 80
                                       2991.      898.     265011.
EIT INTEG & TEST 0 4 0 0
                                       1494.      448.     132176.
B2  ELECTRICAL SYSTEM
E4  ELECTRONICS 5 4 1 0 90
                                         63.       25.       7306.
EIT INTEG & TEST 0 4 0 0
                                         12.        3.       1023.
END
MFG

           ***  PCM MODEL REVISION NINE        24 FEB 1983  ***

*************************************************************************
MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
*************************************************************************


                                      *********** BOEING ***********   SUB/GFE
                                      S.F.L.      Q.C.  MANUFACTUR     TOTAL
                                      HOURS      HOURS    DOLLARS     DOLLARS
                                      ------    ------  ----------   -------
B1  STRUCTURE
M6  TANKS 125 3 6 0 80
                                       6756.     1013.     928911.
M7  CRADLE STRUCTURE 200 3 3 0 80
                                       6758.     1014.     929261.
M4  PLUMBING 50 3 3 0 50
                                       1062.      159.     146033.
E3  CABLING 25 3 3 0 80
                                        252.       38.      34643.
E6  SENSORS 29 3 3 0 80
                                       6311.      947.     867753.
MAC ASSY & C/O 0 3 0 0
                                       1096.      164.     150679.
B2  ELECTRICAL SYSTEM
E4  ELECTRONICS 5 3 3 0 90
```

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A7 CRADLE STRUCTURE [illegible] 80			
	6758.	1014.	929261.
A4 PLUMBING 50 3 3 0 50			
	1062.	159.	146033.
E3 CABLING 25 3 3 0 80			
	252.	38.	34643.
E6 SENSORS 29 3 3 0 80			
	6311.	947.	867785.
MAC ASSY & C/O 0 3 0 0			
	1096.	164.	150670.
B2 ELECTRICAL SYSTEM			
E4 ELECTRONICS 5 3 3 0 90			
	1101.	165.	151409.
EAC ASSY & C/O 0 3 0 0			
	83.	12.	11361.

END

*** PCM MODEL REVISION NINE 24 FEB 1983 ***

*** BOEING*BOEING ** PCM HOURS SUMMARY HOURS PCM ** BOEING*BOEING ****

TITLE: FIRE SAFETY

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	B.F.L.	Q.C.
B1 STRUCTURE	13087	3926	22235	3335
B2 ELECTRICAL SYSTEM	94	28	1184	178
BOEING SUBTOTAL	13181	3954	23419	3513

HARDWARE ASSEMBLY & C/O 4040

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	9492
SOFTWARE ENGINEERING	2433
SYSTEMS GROUND TEST CONDUCT	7523
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	3214
SUPPORT EQUIPMENT MFG	2967
TOOLING & SPECIAL TEST EQUIPMENT	2720
SPARES	2693
LIAISON ENGINEERING	2469
DATA	3978
PROGRAM MANAGEMENT (ENG)	7285
PROGRAM MANAGEMENT (MFG)	6992

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	[illegible]
BOEING HARDWARE BFL & QC HOURS	[illegible]
BOEING SUPPORT HOURS	[illegible]
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	77900

*** PCM MODEL REVISION NINE 24 FEB 1983 ***

****************** DOLLARS SUMMARY IN MILLIONS ******************

TITLE: FIRE SAFETY

	--DEVELOPMENTAL-- ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
B1 STRUCTURE	1.158	3.057
B2 ELECTRICAL SYSTEM	0.008	0.163
SUBSYSTEM HARDWARE SUBTOTAL ($M)	1.167	3.220
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (S1-S50) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		0.483
HARDWARE SUBTOTAL ($M)		3.703
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	0.570	
SOFTWARE ENGINEERING	0.197	
SYSTEMS GROUND TEST CONDUCT	0.576	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.227	0.310
TOOLING & SPECIAL TEST EQUIPMENT		0.326
SPARES		0.322
LIAISON ENGINEERING	0.148	
DATA	0.239	
PROGRAM MANAGEMENT	0.524	0.419
SUPPORT EFFORT SUBTOTAL ($M)	[illegible]	1.377
TOTAL ($M) (NOMINAL SCHEDULE)	3.647	5.081

PAYLOAD ELEMENT NAME
TETHER DYNAMICS TECHNOLOGY

CODE
BACX2019

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name A. POTTER
Address NASA-JOHNSON SPACE CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 1

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 2003 Number of Flights 1 Duration of Flight, Days 90

OBJECTIVE
TO PROVIDE A TECHNOLOGY DEVELOPMENT BASE FOR APPLICATIONS OF LONG TETHERS ATTACHED TO ORBITING SPACECRAFT.

DESCRIPTION
THE MISSIONS PROPOSED WILL PROVIDE THE TECHNOLOGY NEEDED FOR SUCCESSFUL DEPLOYMENT, OPERATION, AND RETRIEVAL OF LONG TETHERS FROM ORBITING SPACECRAFT AND THE USE OF ELECTRODYNAMIC FORCES ON CONDUCTING TETHER FOR CONTROL OF THE TETHER AND GENERATION OF THRUST AND DRAG. AN EXPERIMENTAL TETHER ABOUT 100 METERS LONG WILL BE DEPLOYED, AND ITS DYNAMIC RESPONSE TO MECHANICAL AND ELECTRODYNAMIC FORCES WILL BE MEASURED AND COMPARED WITH THEORY.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar (X) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	1000	16.00
Standby	0	0.00
Peak	0	0.00
Voltage, V	0	Frequency, Hz 0

( ) Continuous

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime (X) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

(X) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

( ) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal (X) External ( ) Remote

Equipment ID/Function ( ) Pressurized (X) Unpressurized

L, m: 2.90	W, m: 1.80	H, m: 3.60	Stowed
L, m: 2.90	W, m: 1.80	H, m: 3.60	Deployed

Launch mass, kg: 705 Return mass, kg: 0

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0

Task Assignments

Skills (See Table B)

Skill	5	11				
Level	3	3				
Hours/Day						

EVA (X) Yes ( ) No Reason OPERATION Hours/EVA 12

SERVICING/MAINTENANCE

Service:	Interval, days	0	Consumables, kg	0
	Returnables, kg	0	Man hours	0.00
Configuration Changes:	Interval, day	0	Man/Hours Required	0.00
	Deliverables, kg	0	Returnables, kg	0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0	days
OTV or TMS on Orbit	0	days
Mission Use	5	days/year
IVA Service	0	man-days/year
EVA Service	2	man-days/year
Experiment Ops	10	man-days/year
Service Frequency	2	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	1

PAYLOAD ELEMENT NAME
LARGE SPACE POWER SYSTEM TECH

CODE
BACX2020

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 11

CONTACT
Name MARTIN VALGORA
Address NASA-LEWIS RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 8

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1995 Number of Flights 0 Duration of Flight, Days 90

OBJECTIVE
DEMONSTRATE THE VIABILITY OF MULTI-VOLTAGE OPERATIONAL SCHEME FOR LARGE, HIGH POWER SPACE POWER SYSTEM FOR SPACE PLATFORMS.

DESCRIPTION
A LARGE SOLAR ARRAY SEGMENT (SIZED UP TO 20 KW) WILL BE ASSEMBLED IN MODULAR FORM CAPABLE OF GENERATING POWER AT VARIOUS VOLTAGES FROM 200 TO 1000 VOLTS. THIS POWER WILL BE BROUGHT INTO A COLLECTION SYSTEM WHERE IT WILL BE CONVERTED TO AC (HIGH FREQUENCY) FOR TRANSMISSION TO A POWER DISTRIBUTOR SYSTEM AT LEAST 50 M AWAY. TRANSMISSION WILL BE OVER SEVERAL LINES. WITHIN THE POWER DISTRIBUTOR, THE POWER WILL BE CONDITIONED FOR USERS (POSSIBLY 120V, 60 CYCLE).

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial (X) Solar ( ) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum 0 Maximum 60
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
L, m: 9.00 W, m: 4.35 H, m: 2.61 Stowed
L, m: 16.00 W, m: 9.00 H, m: 1.00 Deployed
Launch mass, kg: 1197 Return mass, kg: 0.6
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 1 Task Assignments

Skills (See Table B)

Skill	5	11					
Level	3	2					
Hours/Day	2						

EVA (X) Yes ( ) No Reason INSTALLATION ON S.S. Hours/EVA 120

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	90 days/year
IVA Service	10 man-days/year
EVA Service	20 man-days/year
Experiment Ops	80 man-days/year
Service Frequency	10 times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length: 1.00 meters	Width: .50 meters	Height: .50 meters	(Stowed)
Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 200 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	2

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LARGE SPACE POWER SYSTEM TECHNOLOGY 2020

EVA

Activate lights

Activate remote TV

Scan work and storage area

Setup solar array assembly area

Activate RMS and translate to array storage area

Align RMS with array module

Secure RMS to array module

Release array module from storage area

Translate array module to assembly area

Position array module on assembly fixture

Attach array module to assembly fixture

Release RMS

Translate back to storage area

Align RMS with 2nd module

Secure 2nd module to RMS

Release module from storage area

Translate module to assembly fixture

Align 2nd module with 1st module and fixture

Secure 2nd module to 1st module

Release RMS

Continue until solar array completed

Translate RMS to solar array handling point and secure

Release solar array from assembly fixture

Deploy solar array

Secure solar array to boom

Release and stow RMS

Mate cables to power distribution system

Check connections and mounting of solar array

Point array

Turn on power distribution system

Run distribution tests

Stow tools

Scan work and storage area with RTV

Deactivate RTV

Deactivate lights

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```
TY SPACE10 POOCHOUT

 START 5

    REVISION NINE  (15 FEBRUARY 1982)

 CASE LARGE SPACE POWER SYSTEM TECH
 DWRAP 60 95 130 50 120 60 30 15
 REMOTE 0 0
 ASUPPORT 1.0 .3 1 1
 BSUPPORT 1 .2 1 1 1
 WEIGHT 0 0 60 2660
 SCHEDULE 0 0
 FINAL 1 0
 FLIGHT 0 0
 TOOLING 1
 SPARES 10
 SETS 1
 CLASS 0
 DEV

           ***  PCM MODEL REVISION NINE        22 FEB 1983  ***

 **************************************************************************
 ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
 **************************************************************************

                                        ********** BOEING **********   SUB/GFE
                                        DESIGN  DEV SHOP  DES & SHOP    TOTAL
                                        HOURS    HOURS     DOLLARS     DOLLARS
                                        ------  --------  ----------   -------
 D1  STRUCTURE
 X7  SOLAR PANELS 1900 5 0 60
                                         72233.    21670.    6392286.
 M7  FRAME 700 5 0 60
                                         30444.     9133.    2694289.
 XIT INTEG & TEST 0 5 0 0
                                         16548.     4965.    1464539.
 D2  ELECTRICAL SYSTEM
 E4  POWER CONDITIONING 60 5 0 60
                                          2967.      890.     262582.
 EIT INTEG & TEST 0 5 0 0
                                           519.      156.      45939.
 END
 MFG

           ***  PCM MODEL REVISION NINE        22 FEB 1983  ***

 **************************************************************************
 MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
 **************************************************************************

                                        ********** BOEING **********   SUB/GFE
                                        B.F.L.     Q.C.  MANUFACTUR     TOTAL
                                        HOURS     HOURS    DOLLARS     DOLLARS
                                        ------    ------  ----------   -------
 D1  STRUCTURE
 X7  SOLAR PANELS 1900 5 3 0 60
                                        206527.    30979.   28397504.
 M7  FRAME 700 5 3 0 60
                                         31751.     4763.    4367561.
 XAC ASSY & C/O 0 5 0 0
                                         19988.     2998.    2748343.
 D2  ELECTRICAL SYSTEM
 E4  POWER CONDITIONING 60 3 3 0 60
                                          [illegible]     1391.    1274830.
 EAC ASSY & C/O 0 4 0 0
                                           846.      12 .     116161.
 END
           ***  PCM MODEL REVISION NINE        22 FEB 1983  ***

 **************************************************************************
 *** [illegible] ***
```

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                                                19968.      2913.      2748343.
B2  ELECTRICAL SYSTEM
E4  POWER CONDITIONING 60 3 3 0 60
                                                 9271.      1391.      1274830.
FAC ASSY & C/O 0 4 0 0
                                                  848.       127.       116562.
END
         ***  PCM MODEL REVISION NINE        22 FEB 1983  ***
```

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*******************************************************************************
*** BOEING*BOEING **   PCM  HOURS SUMMARY HOURS  PCM   ** BOEING*BOEING ****
*******************************************************************************
```

TITLE: LARGE SPACE POWER SYSTEM TECH

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	S.F.L.	Q.C.
B1 STRUCTURE	119225	35767	258279	38742
B2 ELECTRICAL SYSTEM	3486	1046	10119	1518
BOEING SUBTOTAL	122711	36813	268398	40260

HARDWARE ASSEMBLY & C/O 46299

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	35664
SOFTWARE ENGINEERING	9407
SYSTEMS GROUND TEST CONDUCT	48233
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	19357
SUPPORT EQUIPMENT MFG	14996
TOOLING & SPECIAL TEST EQUIPMENT	9060
SPARES	30866
LIAISON ENGINEERING	28294
DATA	19757
PROGRAM MANAGEMENT (ENG)	50712
PROGRAM MANAGEMENT (MFG)	73171

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	159500
BOEING HARDWARE SFL & QC HOURS	355000
BOEING SUPPORT HOURS	340000
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	854500

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         ***  PCM MODEL REVISION NINE        22 FEB 1983  ***
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*******************************************************************************
******************      DOLLARS SUMMARY IN MILLIONS      *******************
*******************************************************************************
```

TITLE: LARGE SPACE POWER SYSTEM TECH

	--DEVELOPMENTAL--	
	ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
B1 STRUCTURE	10.551	35.513
B2 ELECTRICAL SYSTEM	0.309	1.391
SUBSYSTEM HARDWARE SUBTOTAL ($M)	10.860	36.905
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (S1-S50) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		5.536
HARDWARE SUBTOTAL ($M)		42.440
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	2.140	
SOFTWARE ENGINEERING	0.762	
SYSTEMS GROUND TEST CONDUCT	3.690	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	1.400	1.565
TOOLING & SPECIAL TEST EQUIPMENT		1.087
SPARES		3.690
LIAISON ENGINEERING	1.678	
DATA	1.185	
PROGRAM MANAGEMENT	3.651	4.391
SUPPORT EFFORT SUBTOTAL ($M)	14.526	10.733
TOTAL ($M) (NOMINAL SCHEDULE)	25.386	53.174

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PAYLOAD ELEMENT NAME
LOW COST MODULAR SOLAR PANEL TEC

CODE
BACX2024

CONTACT
Name D.H. SUDDETH
Address LUTHER W. SLIFER
GODDARD

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 11

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1995 Number of Flights 1 Duration of Flight, Days 0

OBJECTIVE
DEVELOP LOW COST SOLAR PANELS.

DESCRIPTION
THIS MISSION WOULD PROVIDE TESTING AND DEMONSTRATING OF THE TECHNOLOGY FOR DESIGN AND MANUFACTURE OF LOW COST SOLAR PANELS. THEIR COSTS WOULD BE GREATLY REDUCED BY THE USE OF DESIGN FEATURES SUITABLE FOR SPACE, BUT WITH APPLICATION OF COMMERCIAL STANDARDS USED FOR THE PRODUCTION OF RELIABLE EARTH-BASED SOLAR PANELS. THE SPACE STATION MAKES POSSIBLE THE CONTINUOUS, LONG-TERM TEST IN PARALLEL OF SEVERAL CANDIDATE SOLAR PANEL AND POWER SYSTEM DESIGNS, IN REAL CONDITIONS. IT MAKES AVAILABLE THE SPACE VACUUM, THE ORBITAL RADIATION ENVIRONMENT AND THE THERMAL CYCLING OF CONTINOUS, FREQUENT ORBITAL ECLIPSES. THE THERMAL CYCLING THAT SOLAR PANELS MUST ENDURE IS ONE OF THE MOST IMPORTANT AND LEAST UNDERSTOOD CAUSES OF SOLAR PANEL FAILURE. THIS MISSION WOULD ALLOW US TO UNDERSTAND THE CAUSES OF THESE FAILURES.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: .60 W, m: 0.45 H, m: 0.15 Stowed
L, m: .60 W, m: 0.45 H, m: 0.15 Deployed
Launch mass, kg: 9 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0

Task Assignments

Skills (See Table B)

Skill	9	11					
Level	2	2					
Hours/Day							

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

```
MISSION TYPE                                         OPS CODE
   Free Flyer
   ( ) Not Serviced                                     F
   ( ) Remote TMS                                       FT
   ( ) Remote Manned                                    FM
   ( ) Serviced at Station (TMS Retrieved)              FST
   ( ) Serviced at Station (Self-propelled)             FS

   Platform Based
   ( ) Not Serviced                                     P
   ( ) Remote TMS                                       PT
   ( ) Remote Manned                                    PM
   ( ) Serviced at Station (TMS Retrieved)              PST
   ( ) Serviced at Station (Self-propelled)             PS

   Other
   (X) Space Station Based                              SS
   ( ) Sortie                                           SOR

CONSTRUCTION/SERVICING COMPLEXITY
   (X) Low
   ( ) Medium
   ( ) High

Operations Times
   OTV Up/Down                             0 days
   OTV or TMS on Orbit                     0 days
   Mission Use                            90 days/year
   IVA Service                             2 man-days/year
   EVA Service                             8 man-days/year
   Experiment Ops                         90 man-days/year
   Service Frequency                       3 times/year

Delta Velocities
   Up                             0.00
   Down                           0.00
   Aero Return                    0.00

Support Equipment
         Length:       3.00 meters     Width:     .50 meters     Height:     .50 meters    (Stowed)
         Length:      12.00 meters     Width:     .10 meters     Height:     .10 meters    (Deployed)

         Mass:         100 kg

Manifest Restrictions
   (X) No Restrictions
   ( ) Only with compatible payloads
   ( ) Fly-Alone
   ( ) Must have Docking Module

Length of Beam Fab                                        0.00
Number of Appendages                                      0
Number of Modules Required to Assemble the Payload        1
```

LOW COST MODULAR SOLAR PANEL TECHNOLOGY 2024

EVA
Activate lights
Activate Remote TV
Scan storage and work area with RTV
Gather tools
Prepare solar panel assembly area
Activate RMS
Translate to solar panel module #1
Attach to module 1
Release module 1 from storage restraints
Translate module 1 to assembly area
Position and secure module 1 to assembly fixture
Release RMS
Prepare module 1 for assembly
Translate RMS to module 2 and secure
Release module 2 from packaging restraints
Translate module 2 to assembly fixture
Align module 2 with module 1 and assembly fixture
Secure module 2 to fixture
Release RMS
Connect module 2 to module 1
Continue as above until solar array assembled
Checkout mechanical and electrical connections
Secure RMS to solar array
Release solar array from assembly fixture
Translate solar array to boom
Attach solar array to boom
Release and stow RMS
Complete mechanical and electrical connections
Checkout mechanical data and electrical connections
Check operation of solar array
Stow assembly fixture
Stow tools
Scan assembly area with RTV
Deactivate RTV
Deactivate lights

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TY SPACE9 FCMOIUT@@@UT
1
 START 5

    REVISION NINE  (15 FEBRUARY 1982)

 CASE MODULAR SOLAR PANEL (SS TEST HARDWARE)
 DURAF 60 95 130 50 120 60 30 15
 REMOTE 0 0
 ASUPPORT 1.0 .3 1 1
 RSUPPORT 1 .2 1 1 1
 WEIGHT 0 0 5 20
 SCHEDULE 0 0
 FINAL 1 0
 FLIGHT 0 0
 TOOLING 1
 SPARES 10
 SETS 1
 CLASS 0
 DEV
1
            ***  FCM MODEL REVISION NINE        22 FEB 1983  ***
0
 *****************************************************************************
 ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
 *****************************************************************************


                                            *********** BOEING **********   SUB/GFE
                                            DESIGN  DEV SHOP  DES & SHOP     TOTAL
                                             HOURS    HOURS     DOLLARS     DOLLARS
                                            ------  --------  ----------    -------
 B1  STRUCTURE
 X7  SOLAR PANELS 13 6 0 5
                                             3091.      927.     273554.
 M7  FRAME 5 5 0 5
                                             1034.      310.      91479.
 XIT INTEG & TEST 0 5 0 0
                                              665.      199.      58833.
 B2  ELECTRICAL SYSTEM
 E4  POWER CONDITIONING 2 5 0 50
                                              228.       68.      20163.
 EIT INTEG & TEST 0 5 0 0
                                               40.       12.       3528.
 END
 MFG
1
            ***  FCM MODEL REVISION NINE        22 FEB 1983  ***
0
 *****************************************************************************
 MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
 *****************************************************************************


                                            *********** BOEING **********   SUB/GFE
                                            B.F.L.      G.C.  MANUFACTUR     TOTAL
                                             HOURS     HOURS    DOLLARS     DOLLARS
                                            ------    ------  ----------    -------
 B1  STRUCTURE
 X7  SOLAR PANELS 13 6 3 0 5
                                             2904.      436.     399242.
 M7  FRAME 5 5 3 0 5
                                              522.       78.      71757.
 XAC ASSY & C/O 0 5 0 0
                                              287.       43.      39508.
 B2  ELECTRICAL SYSTEM
 E4  POWER CONDITIONING 2 5 3 0 50
                                              684.      103.      93989.
 EAC ASSY & C/O 0 5 0 0
                                               75.       11.      10374.
 END
            ***  FCM MODEL REVISION NINE        22 FEB 1983  ***

 *****************************************************************************
 *** BOEING*BOEING **   FCM  HOURS SUMMARY HOURS  FCM   ** BOEING*BOEING ****
```

	687.	93.	97...
B2 ELECTRICAL SYSTEM			
E1 POWER CONDITIONING 2 3 3 0 50			
	684.	103.	93989.
EAC ASSY & C/O 0 5 0 0			
	75.	11.	10374.

END

1 *** PCM MODEL REVISION NINE 22 FEB 1983 ***

*** BOEING*BOEING ** PCM HOURS SUMMARY HOURS PCM ** BOEING*BOEING ****

TITLE: MODULAR SOLAR PANEL (SS TEST HARDWARE)

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	B.F.L.	Q.C.
B1 STRUCTURE	4789	1437	3713	557
B2 ELECTRICAL SYSTEM	268	80	759	114
BOEING SUBTOTAL	5057	1517	4472	671

HARDWARE ASSEMBLY & C/O 771

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	1418
SOFTWARE ENGINEERING	352
SYSTEMS GROUND TEST CONDUCT	397
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	182
SUPPORT EQUIPMENT MFG	231
TOOLING & SPECIAL TEST EQUIPMENT	213
SPARES	514
LIAISON ENGINEERING	471
DATA	345
PROGRAM MANAGEMENT (ENG)	1525
PROGRAM MANAGEMENT (MFG)	1228

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	6600
BOEING HARDWARE BFL & QC HOURS	5900
BOEING SUPPORT HOURS	6900
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	19400

1 *** PCM MODEL REVISION NINE 22 FEB 1983 ***

****************** DOLLARS SUMMARY IN MILLIONS ******************

TITLE: MODULAR SOLAR PANEL (SS TEST HARDWARE)

	--DEVELOPMENTAL--	
	ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
B1 STRUCTURE	0.424	0.511
B2 ELECTRICAL SYSTEM	0.024	0.104
SUBSYSTEM HARDWARE SUBTOTAL ($M)	0.448	0.615
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (S1-650) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		0.092
HARDWARE SUBTOTAL ($M)		0.707
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	0.085	
SOFTWARE ENGINEERING	0.029	
SYSTEMS GROUND TEST CONDUCT	0.030	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.013	0.024
TOOLING & SPECIAL TEST EQUIPMENT		0.026
SPARES		0.061
LIAISON ENGINEERING	0.028	
DATA	0.021	
PROGRAM MANAGEMENT	0.110	0.074
SUPPORT EFFORT SUBTOTAL ($M)	0.316	0.185
TOTAL ($M) (NOMINAL SCHEDULE)	0.763	0.892

PAYLOAD ELEMENT NAME
SINGLE CRYSTAL RHODIUM WAFERS

CODE
BACX2027

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name JAG. J. SING
Address NASA-LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 2

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1996 Number of Flights 1 Duration of Flight, Days 90

OBJECTIVE
DEVELOP TECHNOLOGY FOR THE GROWTH OF THIN (500-1000 A) PERFECT SINGLE CRYSTAL WAFERS. ONE SPECIFIC APPLICATION OF INTEREST IS TO DEVELOP RH103 WAFERS FOR USE IN PD 103 MOSSBAUER GRAVITOMETRY.

DESCRIPTION
OUR EFFORTS TO DATE HAVE NOT SUCCEEDED IN DEVELOPING SINGLE CRYSTAL RH 103 WAFERS OF SUFFICIENT PERFECTION TO PERMIT SUCCESSFUL MOSSBAUER SPECTROMETRY BASED ON PD103-RH103 TRANSITION. IT IS EXPECTED THAT AN MBE GROWTH EXPERIMENT IN NEAR-ZERO G ENVIRONMENT WILL PERMIT STRAIN-FREE CRYSTALLINE GROWTH.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	1000	24.00
Standby		
Peak		

(X) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime (X) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location (X) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 2.00 W, m: 1.00 H, m: 1.00 Stowed
L, m: 1.00 W, m: 1.00 H, m: 1.00 Deployed
Launch mass, kg: 200 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 1 Task Assignments

Skills (See Table B)

Skill	3					
Level	3					
Hours/Day	4					

EVA ( ) Yes (X) No Reason Hours/EVA

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times	
OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	45 days/year
IVA Service	2 man-days/year
EVA Service	0 man-days/year
Experiment Ops	45 man-days/year
Service Frequency	1 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width: meters	Height: meters	(Stowed)
Length:	meters	Width: meters	Height: meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 1

Cost Data

Name and Phone Number: G. REID 3-2020

DESCRIPTION
OUR EFFORTS TO DATE HAVE NOT SUCCEEDED IN DEVELOPING SINGLE CRYSTAL RH 103 WAFERS OF SUFFICIENT PERFECTION TO PERMIT SUCCESSFUL MOSSBAUER SPECTROMETRY BASED ON PD103-RH103 TRANSITION. IT IS EXPECTED THAT AN MBE GROWTH EXPERIMENT IN NEAR-ZERO G ENVIRONMENT WILL PERMIT STRAIN-FREE CRYSTALLINE GROWTH.

Item Dry Weight: 440 pounds Volume: 4.40 cubic feet

Structural Weight (includes typical "mechanical" items listed below): 400.00 pounds

Design Complexity: 3

Manufacturing Complexity for Structural/Mechanical Items: 3
Typical "mechanical" items include enclosures, optics, motors, blowers, gyros, batteries, cables, connectors, switches, indicators, cathode ray tubes, antennas without electronics, mechanisms, waveguides, etc.

Electronic Equipment Description:

Analog	10	%
Digital		%
Power Supplies	90	%
Other		%

Manufacturing Complexity for Electronic Items: 3

Weight of the Circuit Board and Electronics Mounted on it: 2.00 pounds

Material Used for the Enclosure: Machine Casting?

Of the electronics weight, what % is off-the-shelf? 0

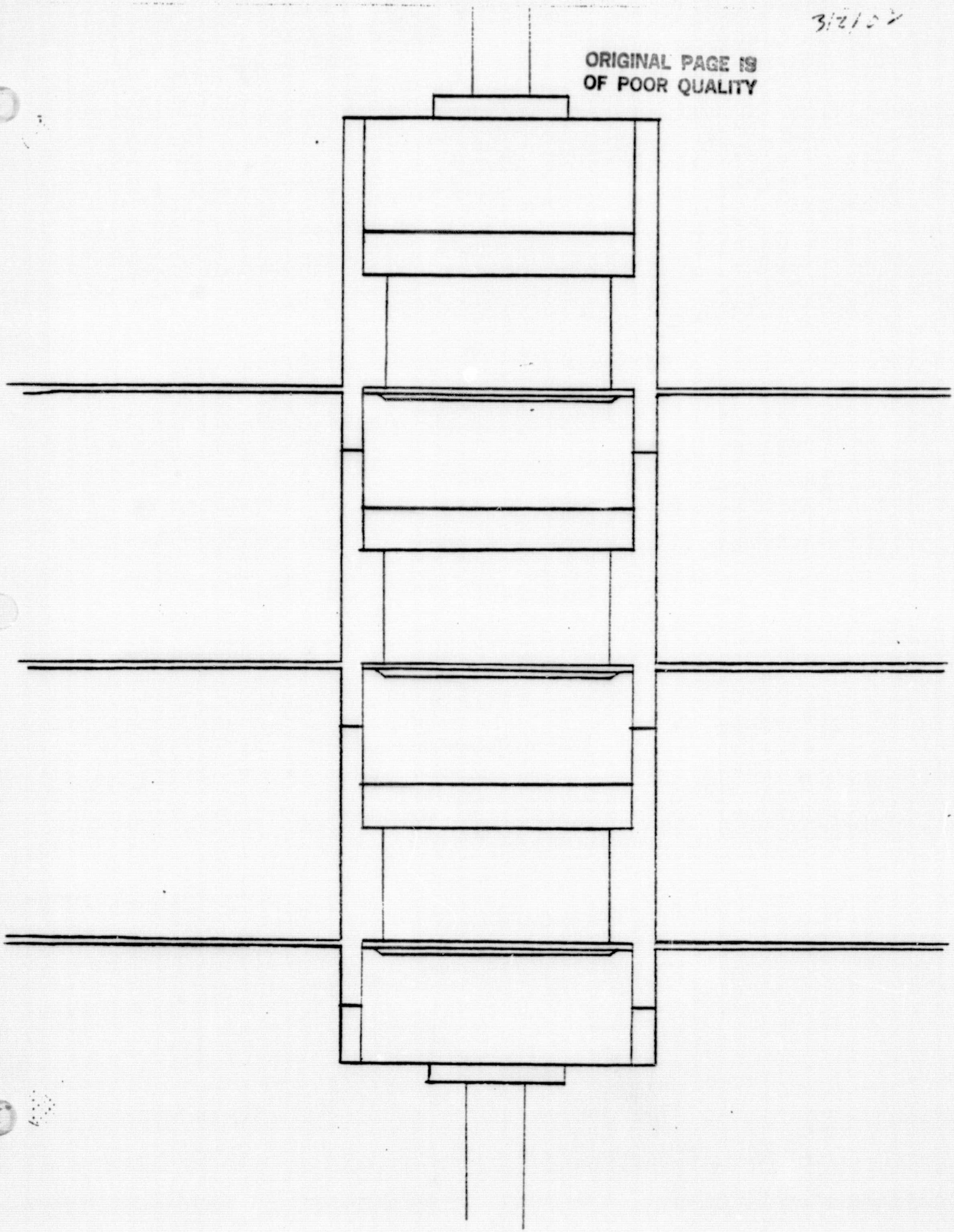
Of the sturctural weight, what % is off-the-shelf? 0

Manufacturing Degree of Automation

Electronics	( ) Low	(X) Medium	( ) High
Mechanical	( ) Low	(X) Medium	( ) High

Is the item Hardened? No

3/2/07



--- PRICE 84 ---
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:47 FILENAME: REID.DAT
(283010)

FURNACE---SINGLE CRYSTAL RHODIUM WAFERS

		UNIT WEIGHT	202.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	4.40	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	156.	-	156.
DESIGN	491.	-	491.
SYSTEMS	74.	-	74.
PROJECT MGMT	270.	-	270.
DATA	33.	-	33.
SUBTOTAL(ENG)	1025.	-	1025.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	296.	-	296.
TOOL-TEST EQ	198.	-	198.
SUBTOTAL(MFG)	494.	-	494.
TOTAL COST	1519.	-	1519.

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SINGLE CRYSTAL RHODIUM WAFERS 2027

IVA

Prepare work area

Checkout oven

Obtain sample from storage

Mount sample in oven

Set oven controls

Close & secure oven door

Turn on oven

Activate timer

Monitor sample progress

Turn off oven

Open oven door

Remove rhodium crystal

Analyze crystal

Package crystal for return to earth

Clean up lab area

PAYLOAD ELEMENT NAME
HABITABILITY CRITERIA VALIDATION

CODE
BACX2029

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 14

CONTACT
Name D.G. STEPHENS
Address LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1995 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
VALIDATE NOISE AND VIBRATION ENVIRONMENT CRITERIA FOR LONG DURATION MANNED SPACE MISSIONS.

DESCRIPTION
OBJECTIVE AND SUBJECTIVE TESTS WILL BE CONDUCTED TO VALIDATE HABITABILITY CRITERIA DEVELOPED FOR THE NOISE AND VIBRATION ENVIRONMENT OF THE SPACE STATION. TESTS WILL ASSESS THE EFFECTS OF THE SPACE STATION NOISE AND VIBRATION ENVIRONMENT ON HEARING, SPEECH, TASK PERFORMANCE, ANNOYANCE, AND SLEEP OF THE CREW. OTHER TESTS WILL MEASURE AND MONITOR THE NOISE AND VIBRATION ENVIRONMENT ABOARD THE SPACE STATION FOR COMPARISON WITH PREDICTED ENVIRONMENTS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	200	
Standby		( ) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS

Monitoring Requirements:
(X) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL

( ) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS

Location (X) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.50 W, m: 0.50 H, m: 0.50 Stowed
L, m: 0.50 W, m: 0.50 H, m: 0.50 Deployed
Launch mass, kg: 5 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 1

Task Assignments

Skills (See Table B)

Skill	1					
Level	2					
Hours/Day						

EVA (X) Yes ( ) No Reason INSTALL SENSORS Hours/EVA 12

SERVICING/MAINTENANCE

Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	365 days/year
IVA Service	4 man-days/year
EVA Service	2 man-days/year
Experiment Ops	15 man-days/year
Service Frequency	2 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length: meters	Width: meters	Height: meters	(Stowed)
Length: meters	Width: meters	Height: meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 1

- - - PRICE 84 - - -
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:48 FILENAME: REID.DAT
(283010)

HABITIBILITY CRITERIA VALIDATION (NOISE LEVEL METER)

		UNIT WEIGHT	10.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	1.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	109.	-	109.
DESIGN	342.	-	342.
SYSTEMS	52.	-	52.
PROJECT MGMT	196.	-	196.
DATA	24.	-	24.
SUBTOTAL(ENG)	721.	-	721.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	263.	-	263.
TOOL-TEST EQ	151.	-	151.
SUBTOTAL(MFG)	414.	-	414.
TOTAL COST	1135.	-	1135.

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PAYLOAD ELEMENT NAME
SPACECRAFT HANGAR (LSS-2)

CODE
BACX2034

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name RICHARD GATES
Address BOEING AEROSPACE CO
PO BOX 3999
SEATTLE, WA 98124

Telephone (206) 773-2020

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 8

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1990 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
LARGE SPACE STRUCTURES TECHNOLOGY DEMONSTRATIONS (DEPLOYMENT AND ASSEMBLY, SUBSYSTEM INSTALLATION AND CHECKOUT, DEMONSTRATION OF MAN'S ROLE AND CAPABILITIES IN SPACE). FOLLOWING THE TDM, THIS STRUCTURE WILL SERVE AS A PERMANENT SPACE STATION FACILITY.

DESCRIPTION
THE SPACECRAFT HANGAR FACILITY IS A DEPLOYABLE OR ASSEMBLABLE STRUCTURE TO PROVIDE SOLAR RADIATION AND MICROMETERIORITE PROTECTION FOR PERSONNEL, SPACECRAFT AND OTV'S WHILE SERVICING IS BEING PERFORMED. ELECTRICAL POWER AND LIGHTING WILL BE PROVIDED AS WELL AS CONTAINMENT FOR TOOLS, PARTS & PERSONNEL.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	500	(X) Continuous
Standby		
Peak		

Voltage, V   Frequency, Hz

DATA/COMMUNICATIONS

Monitoring Requirements:
( ) None   (X) Realtime   ( ) Offline   ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS):   Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog   ( ) Digital   Hours/Day
Film (Amount):   Voice (Hours/Day):
Live TV (Hours/Day):   Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit)   Downlink command rate:
Recording Rate (KBPS)   Downlink Frequency (MHz):

THERMAL

( ) Active   (X) Passive
Temperature, deg C   Operational Minimum   Maximum
Non-operational Minimum   Maximum
Heat Rejection, w   Operational Minimum   Maximum
Non-operational Minimum   Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS

Location   ( ) Internal   (X) External   ( ) Remote
Equipment ID/Function   ( ) Pressurized   (X) Unpressurized
Length: 5.75 meters   Width: 8.7   meters   Height: 5.23   meters   (Stowed)
Length: 18.00 meters   Width: 9.00 meters   Height: 9.00 meters   (Deployed)
Launch mass, kg: 270   Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g)   min: 0.00E+00   max: 0.00E+00

CREW REQUIREMENTS

Crew Size   Task Assignments

Skills (See Table B)

Skill	11	12	13			
Level	3	3	3			
Hours/Day						

EVA   (X) Yes   ( ) No   Reason   CONSTRUCTION   Hours/EVA   120

SERVICING/MAINTENANCE

Service: Interval   days   Consumables   kg
Returnables   kg   Man hours required
Configuration Changes: Interval   days   Man/Hours Required
Deliverables   kg   Returnables   kg

SPECIAL CONSIDERATIONS/See instructions

AS A TECHNOLOGY DEMONSTRATION MISSON (TDM), REALTIME MONITORING (TV) AND DATA MEASUREMENT EQUIPMENT (STRUCTURAL DYNAMICS, THERMAL DEFLECTIONS) WILL BE REQUIRED. FOLLOWING THE TDM, SYSTEM STATUS (RETRACTED/DEPLOYED/LATCHED) INSTRUMENTATION WILL BE REQUIRED.

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	365 days/year
IVA Service	10 man-days/year
EVA Service	20 man-days/year
Experiment Ops	48 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length: meters	Width: meters	Height: meters	(Stowed)
Length: meters	Width: meters	Height: meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 16

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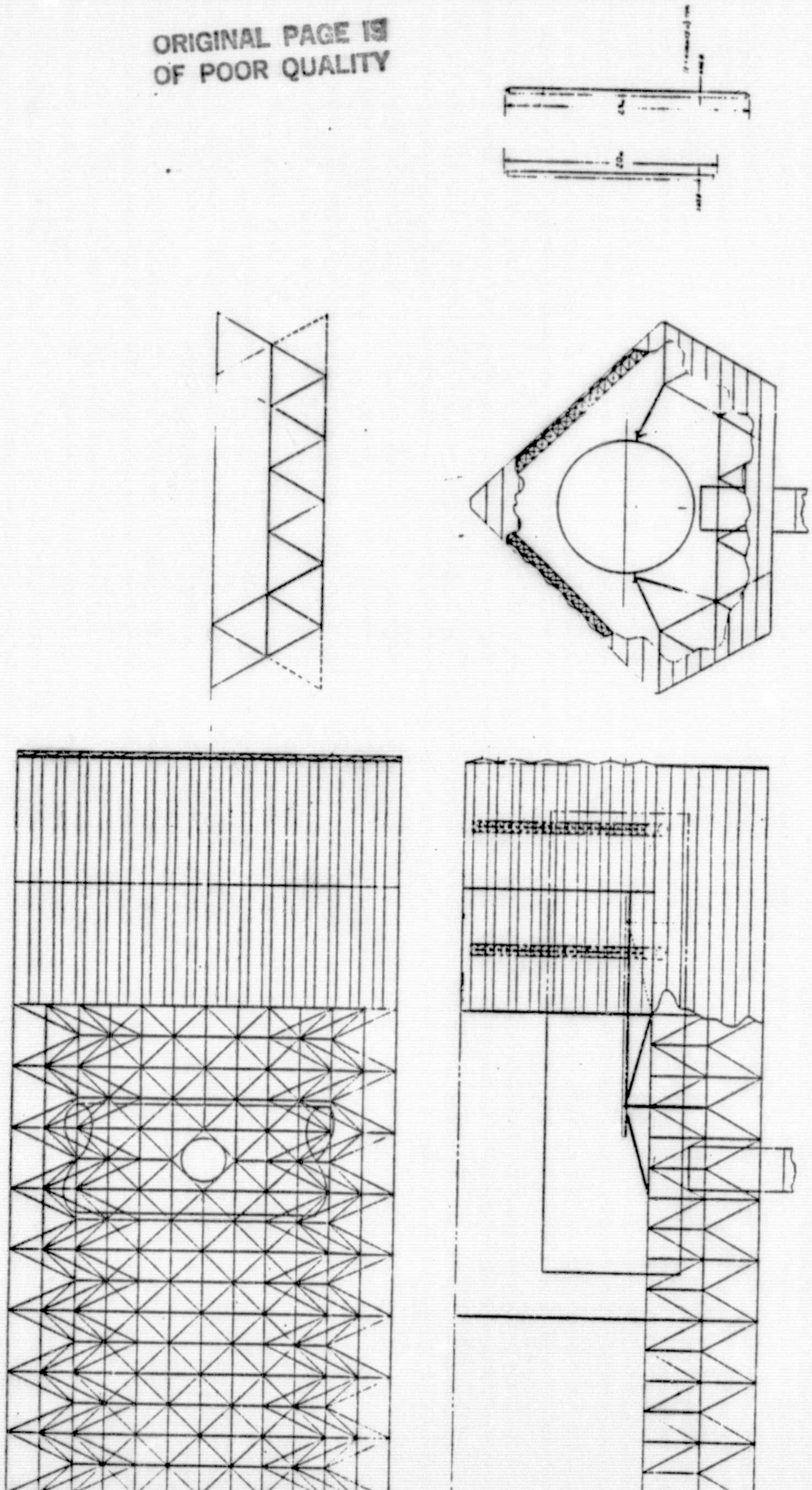

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START 3

   REVISION NINE  (15 FEBRUARY 1982)

CASE SPACE STATION HARDWARE (DEV)
DWRAP 60 95 130 50 120 60 30 15
REMOTE 0 0
ASUPPORT 1 .3 1 .5
BSUPPORT .5 .2 1 1 1
WEIGHT 0 0 5 600
SCHEDULE 0 0
FINAL 1 0
FLIGHT 0 0
TOOLING 1
SPARES 10
SETS 1
CLASS 0
MILL 1
DEV
```

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

ENGINEERING ****** ENGINEERING ******** ENGINEERING ****** ENGINEERING

$$$$$$$$$$ MILLIONS $$$$$$$$$$	BOEING DESIGN HOURS	BOEING DEV SHOP HOURS	BOEING DES & SHOP DOLLARS	SUB/GFE TOTAL DOLLARS
32 STRUCTURE--HANGAR				
A7 HANGAR--STRUCTURE 150 4 1.2 0 0	19497.	5849.	1.725	
A2 HANGAR--SUPPORT 450 4 1.2 0 0	12603.	3781.	1.115	

END
MFG

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

MANUFACTURING **** MANUFACTURING **** MANUFACTURING **** MANUFACTURING

$$$$$$$$$$ MILLIONS $$$$$$$$$$	BOEING S.F.L. HOURS	BOEING Q.C. HOURS	BOEING MANUFACTUR DOLLARS	SUB/GFE TOTAL DOLLARS
32 STRUCTURE--HANGAR				
A7 HANGAR-STRUCTURE 150 4 2 0 0	4945.	742.	0.680	
A2 HANGAR-SUPPORT 450 4 1 0 0	2968.	445.	0.408	

END

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

*** BOEING*BOEING ** PCM HOURS SUMMARY HOURS PCM ** BOEING*BOEING ****

TITLE: SPACE STATION HARDWARE (DEV)

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	S.F.L.	Q.C.
32 STRUCTURE--HANGAR	32100	9630	7913	1187
BOEING SUBTOTAL	32100	9630	7913	1187

HARDWARE ASSEMBLY & C/O 1365

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	7029
SOFTWARE ENGINEERING	1759
SYSTEMS GROUND TEST CONDUCT	4083
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	891
SUPPORT EQUIPMENT MFG	873
TOOLING & SPECIAL TEST EQUIPMENT	2371
SPARES	910
LIAISON ENGINEERING	834
DATA	2504
PROGRAM MANAGEMENT (ENG)	9285
PROGRAM MANAGEMENT (MFG)	2696

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	41730
BOEING HARDWARE SFL & QC HOURS	10500

SUPPORT EQUIPMENT	[illegible]
TOOLING & SPECIAL TEST EQUIPMENT	2891
SPARES	910
LIAISON ENGINEERING	834
DATA	3504
PROGRAM MANAGEMENT (ENG)	9288
PROGRAM MANAGEMENT (MFG)	2698

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BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	41700
BOEING HARDWARE BFL & QC HOURS	10500
BOEING SUPPORT HOURS	33800
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	86000

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: SPACE STATION HARDWARE (DEV)

	--DEVELOPMENTAL-- ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
B2 STRUCTURE--HANGAR	2.841	1.088
SUBSYSTEM HARDWARE SUBTOTAL ($M)	2.841	1.088
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (S1-S50) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		0.163
HARDWARE SUBTOTAL ($M)		1.251
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	0.422	
SOFTWARE ENGINEERING	0.143	
SYSTEMS GROUND TEST CONDUCT	0.312	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.063	0.092
TOOLING & SPECIAL TEST EQUIPMENT		0.347
SPARES		0.109
LIAISON ENGINEERING	0.050	
DATA	0.150	
PROGRAM MANAGEMENT	0.859	0.162
SUPPORT EFFORT SUBTOTAL ($M)	1.809	0.709
TOTAL ($M) (NOMINAL SCHEDULE)	4.649	1.960

PAYLOAD ELEMENT NAME
MATERIALS EXPOSURE LAB

CODE
EACX2035

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name
Address

TElephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1998 Number of Flights 2 Duration of Flight, Days 365

OBJECTIVE
MATERIALS DEVELOPMENT, MATERIALS TESTING TECHNIQUES.

DESCRIPTION
PROVISIONS WOULD BE PROVIDED TO ATTACH MATERIAL SPECIMENS TO THE SPACE STATION SOLAR ARRAY CANISTERS TO PROVIDE LONG TERM EXPOSURE TO SOLAR RADIATION. THE SPECIMENS WOULD BE RETRIEVED PERIODICALLY VIA EVA FOR TESTING.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial (X) Solar ( ) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:

(X) None   ( ) Realtime   ( ) Offline   ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS):   Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog   ( ) Digital   Hours/Day
Film (Amount):   Voice (Hours/Day):
Live TV (Hours/Day):   Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit)   Downlink command rate:
Recording Rate (KBPS)   Downlink Frequency (MHz):

THERMAL
( ) Active   (X) Passive
Temperature, deg C   Operational Minimum   Maximum
Non-operational Minimum   Maximum
Heat Rejection, w   Operational Minimum   Maximum
Non-operational Minimum   Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location   ( ) Internal   (X) External   ( ) Remote
Equipment ID/Function   ( ) Pressurized   ( ) Unpressurized
Length: 4.3 meters   Width: .5 meters   Height: .04 meters   (Stowed)
Length: 4.3 meters   Width: .5 meters   Height: .04 meters   (Deployed)
Launch mass, kg: 202   Return mass, kg:
Consumable Types   NONE
Acceleration Sensitivity, (g)   min: 0.00E+00   max: 0.00E+00

CREW REQUIREMENTS
Crew Size   Task Assignments

Skills (See Table B)

Skill	11	12	13	7	8	9	15
Level	3	3	3	3	3	3	3
Hours/Day							

EVA (X) Yes ( ) No   Reason SPECIMEN RETRIEVAL   Hours/EVA 48

SERVICING/MAINTENANCE
Service: Interval 90 days   Consumables 100 kg
Returnables 0 kg   Man hours required 8.00
Configuration Changes: Interval 90 days   Man/Hours Required 8.00
Deliverables 2000 kg   Returnables 2000 kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
(X) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times	
OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	365 days/year
IVA Service	5 man-days/year
EVA Service	8 man-days/year
Experiment Ops	12 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)
Mass:	kg					

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 1

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```
 TY SPACES PCMOUT
1
  START 5

     REVISION NINE  (15 FEBRUARY 1982)

  CASE MATERIALS EXPOSURE LAB (SS TEST HARDWARE)
  DWRAP 60 95 130 50 120 60 30 15
  REMOTE 0 0
  ASUPPORT 1.0 .3 1 1
  BSUPPORT 1 .2 1 1 1
  WEIGHT 0 0 20 150
  SCHEDULE 0 0
  FINAL 1 0
  FLIGHT 0 0
  TOOLING 1
  SPARES 10
  SETS 1
  CLASS 0
  DEV
1
           ***  PCM MODEL REVISION NINE         22 FEB 1983  ***
0
  ***************************************************************************
  ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
  ***************************************************************************


                                       *********** BOEING **********   SUB/GFE
                                       DESIGN  DEV SHOP  DES & SHOP    TOTAL
                                        HOURS    HOURS     DOLLARS    DOLLARS
                                       ------  --------  ----------   -------
  B1  STRUCTURE
  A7  FRAME 150 2 1.2 1 0 20
                                         9457.     2837.     836969.

  KIT INTEG & TEST 0 3.0 0
                                         1038.      311.      91845.
  END
  MFG

           ***  PCM MODEL REVISION NINE         22 FEB 1983  ***

  ***************************************************************************
  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
  ***************************************************************************


                                       ********** BOEING **********    SUB/GFE
                                       B.F.L.       Q.C.  MANUFACTUR    TOTAL
                                        HOURS      HOURS    DOLLARS    DOLLARS
                                       ------     ------  ----------   -------
  B1  STRUCTURE
  A7  FRAME 150 2 1 3 0 20
                                         4729.       709.     650252.

  MAC ASSY & C/O 0 3 0 0
                                          245.        37.      33707.
  END
1          ***  PCM MODEL REVISION NINE         22 FEB 1983  ***

  ***************************************************************************
  *** BOEING*BOEING **   PCM  HOURS SUMMARY HOURS  PCM   ** BOEING*BOEING ****
  ***************************************************************************
0
   TITLE:  MATERIALS EXPOSURE LAB (SS TEST HARDWARE)
   ------------------------------------------------------------------

           BOEING HARDWARE SUBSYSTEM HOURS
                                 DESIGN     DEV SHOP       B.F.L.         Q.C.
                             ----------   ----------   ----------   ----------
   B1  STRUCTURE                  10495         3149         4974          746
                             ----------   ----------   ----------   ----------
           BOEING SUBTOTAL        10495         3149         4974          746

                                  HARDWARE ASSEMBL[illegible]              550


           BOEING SUPPORT HOURS
      SYSTEM ENGINEERING & INTEGRATION            [illegible]
```

	DESIGN	DEV SHOP	B.F.L.	G.C.
61 STRUCTURE	10495	3149	4974	746
BOEING SUBTOTAL	10495	3149	4974	746

HARDWARE ASSEMBLY & C/O 858

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	2898
SOFTWARE ENGINEERING	721
SYSTEMS GROUND TEST CONDUCT	1151
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	516
SUPPORT EQUIPMENT MFG	583
TOOLING & SPECIAL TEST EQUIPMENT	998
SPARES	372
LIAISON ENGINEERING	524
DATA	846
PROGRAM MANAGEMENT (ENG)	3192
PROGRAM MANAGEMENT (MFG)	1554

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	13600
BOEING HARDWARE BFL & GC HOURS	6600
BOEING SUPPORT HOURS	13600
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	33800

*** PCM MODEL REVISION NINE 22 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: MATERIALS EXPOSURE LAB (SS TEST HARDWARE)

	--DEVELOPMENTAL--	
	ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
61 STRUCTURE	0.929	0.684
SUBSYSTEM HARDWARE SUBTOTAL ($M)	0.929	0.684
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (91-850) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		0.103
HARDWARE SUBTOTAL ($M)		0.787
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	0.174	
SOFTWARE ENGINEERING	0.059	
SYSTEMS GROUND TEST CONDUCT	0.088	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.036	0.061
TOOLING & SPECIAL TEST EQUIPMENT		0.120
SPARES		0.068
LIAISON ENGINEERING	0.031	
DATA	0.031	
PROGRAM MANAGEMENT	0.230	0.093
SUPPORT EFFORT SUBTOTAL ($M)	0.669	0.342
TOTAL ($M) (NOMINAL SCHEDULE)	1.597	1.129

PAYLOAD ELEMENT NAME
PRECISION OPTICAL SYSTEM (LSS-4)

CODE
BACX2036

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name RICHARD GATES
Address BOEING AEROSPACE CO
PO BOX 3999
SEATTLE, WA 98124

Telephone 206/773-2020

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 2000 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
LARGE APERTURE IR ASTRONOMY FACILITY AND LARGE SPACE STRUCTURES TECHNOLOGY DEMONSTRTION MISSION (DEPLOYMENT AND ASSEMBLY, ASSEMBLY OF HIGH-PRECISION RIGID STRUCTURE, SUBSYSTEM INSTALLATION AND CHECKOUT, PRECISION CONTROL OF LSS, ADAPTIVE OPTICS, DEMONSTRATE MAN'S ROLE AND CAPABILITIES, SYSTEM IDENTIFICATION, SEGMENTED MIRRORS).

DESCRIPTION
THIS IS A LARGE AMBIENT IR TELESCOPE THAT IS ASSEMBLED FROM MODULES (PRIMARY MIRROR SEGMENTS, STRUCTURAL MODULES, SECONDARY MIRROR ASSEMBLY, INSTRUMENTATION MODULE, SOLAR ARRAYS, RADIATORS, PROPULSION TANKS, ETC.). AFTER ASSEMBLY, SYSTEM TESTS, TECHNOLOGY DEMO TESTS, ETC, ARE COMPLETED THIS TELESCOPE WOULD BE TRANSFERRED TO AN ORBITAL POSITION WHERE IT WOULD THEN BE REMOTELY OPERATED FROM A GROUND STATION.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction (X) Inertial ( ) Solar ( ) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	500	
Standby		(X) Continuous
Peak		

Voltage, V   Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None   (X) Realtime   (X) Offline   ( ) Other:
( ) Encription/Decription Required
(X) Uplink Required: Command Rate (KBS):   Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog   (X) Digital   Hours/Day
Film (Amount):   Voice (Hours/Day):
Live TV (Hours/Day):   Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit)   Downlink command rate:
Recording Rate (KBPS)   Downlink Frequency (MHz):

THERMAL
(X) Active   ( ) Passive
Temperature, deg C   Operational Minimum   Maximum
Non-operational Minimum   Maximum
Heat Rejection, w   Operational Minimum   Maximum
Non-operational Minimum   Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location   ( ) Internal   ( ) External   (X) Remote
Equipment ID/Function   ( ) Pressurized   ( ) Unpressurized
Length: 5.00 meters   Width: 4.50 meters   Height: 4.50 meters   (Stoved)
Length: 12.00 meters   Width: 12.00 meters   Height: 28.0 meters   (Deployed)
Launch mass, kg: 2014   Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g)   min: 0.00E+00   max: 0.00E+00

CREW REQUIREMENTS
Crew Size   8   Task Assignments

Skills (See Table B)

Skill	11	12	13			
Level	3	3	3			
Hours/Day						

EVA (X) Yes ( ) No   Reason CONSTRUCTION   Hours/EVA 84.00

SERVICING/MAINTENANCE
Service: Interval 180 days   Consumables 200 kg
Returnables 0 kg   Man hours required 8.00
Configuration Changes: Interval 180 days   Man/Hours Required 8.00
Deliverables 1000 kg   Returnables 1000 kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE — **OPS CODE**

Free Flyer

( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
(X) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY

( ) Low
( ) Medium
(X) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	365 days/year
IVA Service	10 man-days/year
EVA Service	23 man-days/year
Experiment Ops	10 man-days/year
Service Frequency	2 times/year

Delta Velocities

Up
Down
Aero Return

Support Equipment

Length:	2.5	meters	Width:	2.5	meters	Height:	1	meters	(Stowed)
Length:	26	meters	Width:	12	meters	Height:	3.5	meters	(Deployed)

Mass: 2000 kg

Manifest Restrictions

(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	
Number of Appendages	7
Number of Modules Required to Assemble the Payload	82

2

--- PRICE 84 ---
ELECTRONIC ITEM

DATE 7-MAR-83 TIME 18:55 FILENAME: REID2.DAT
(283010)

PRECISION OPTICAL SYSTEM

		UNIT WEIGHT	2880.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	86.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	5702.	-	5702.
DESIGN	18565.	-	18565.
SYSTEMS	3394.	-	3394.
PROJECT MGMT	11671.	-	11671.
DATA	1321.	-	1321.
SUBTOTAL(ENG)	40654.	-	40654.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	26279.	-	26279.
TOOL-TEST EQ	14123.	-	14123.
SUBTOTAL(MFG)	40402.	-	40402.
TOTAL COST	81055.	-	81055.

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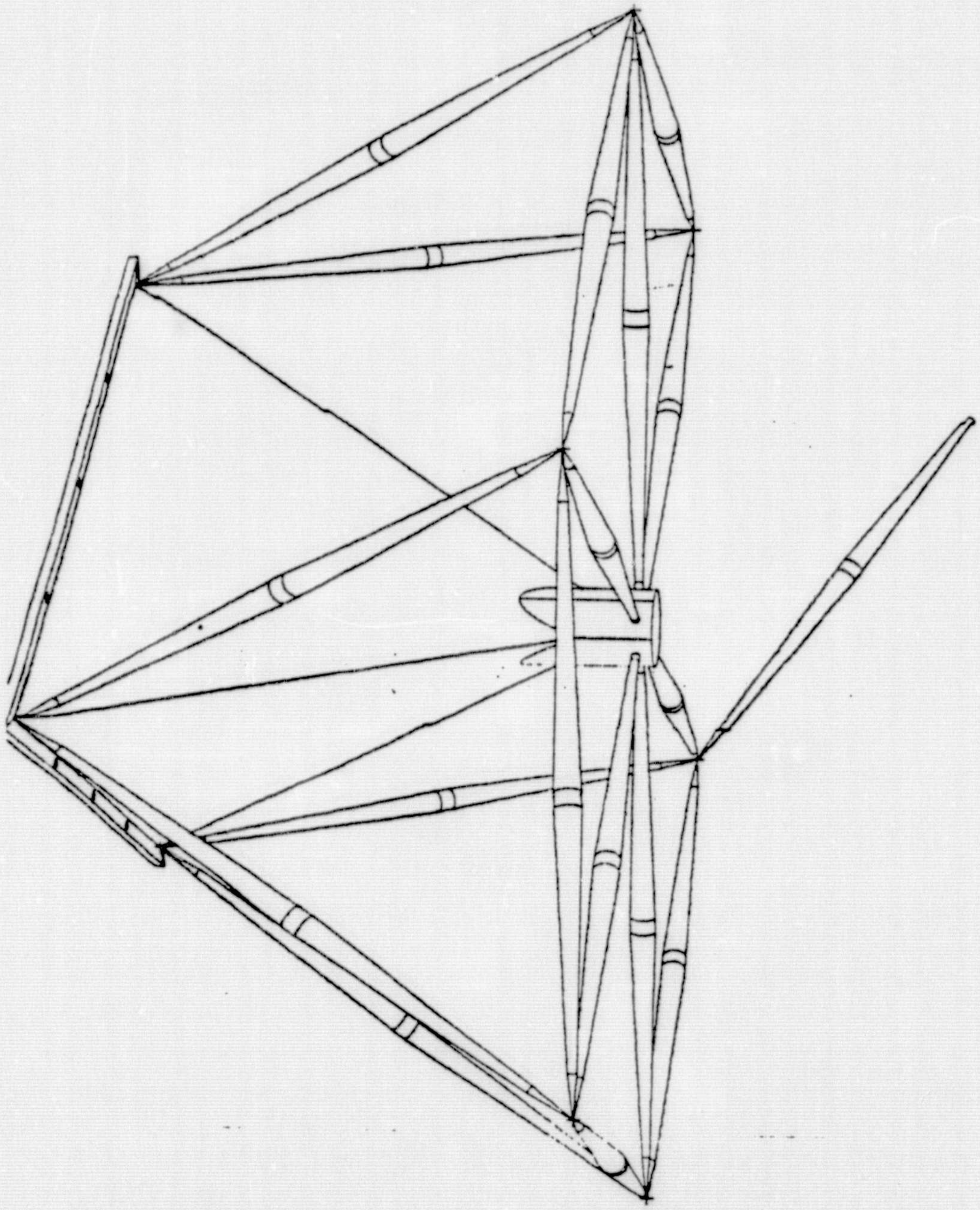
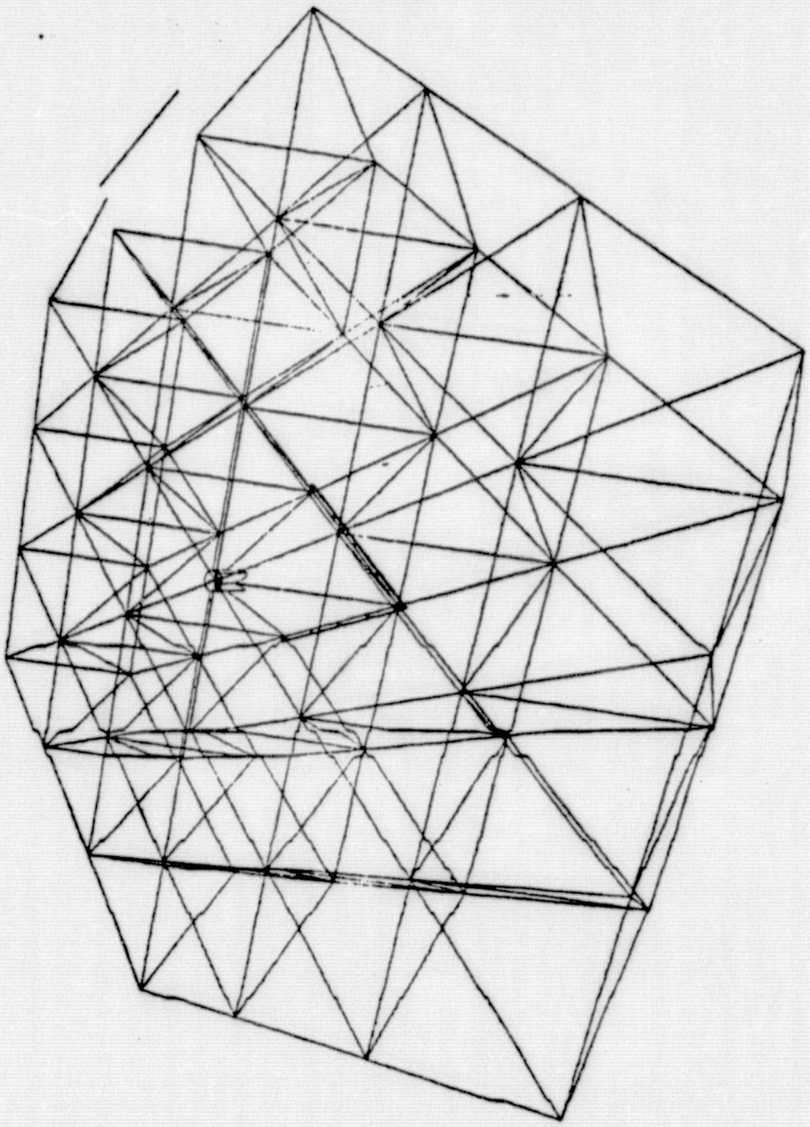
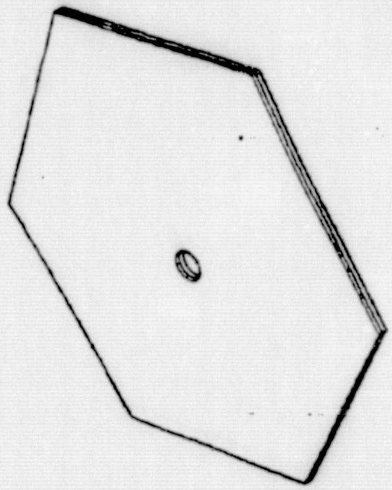
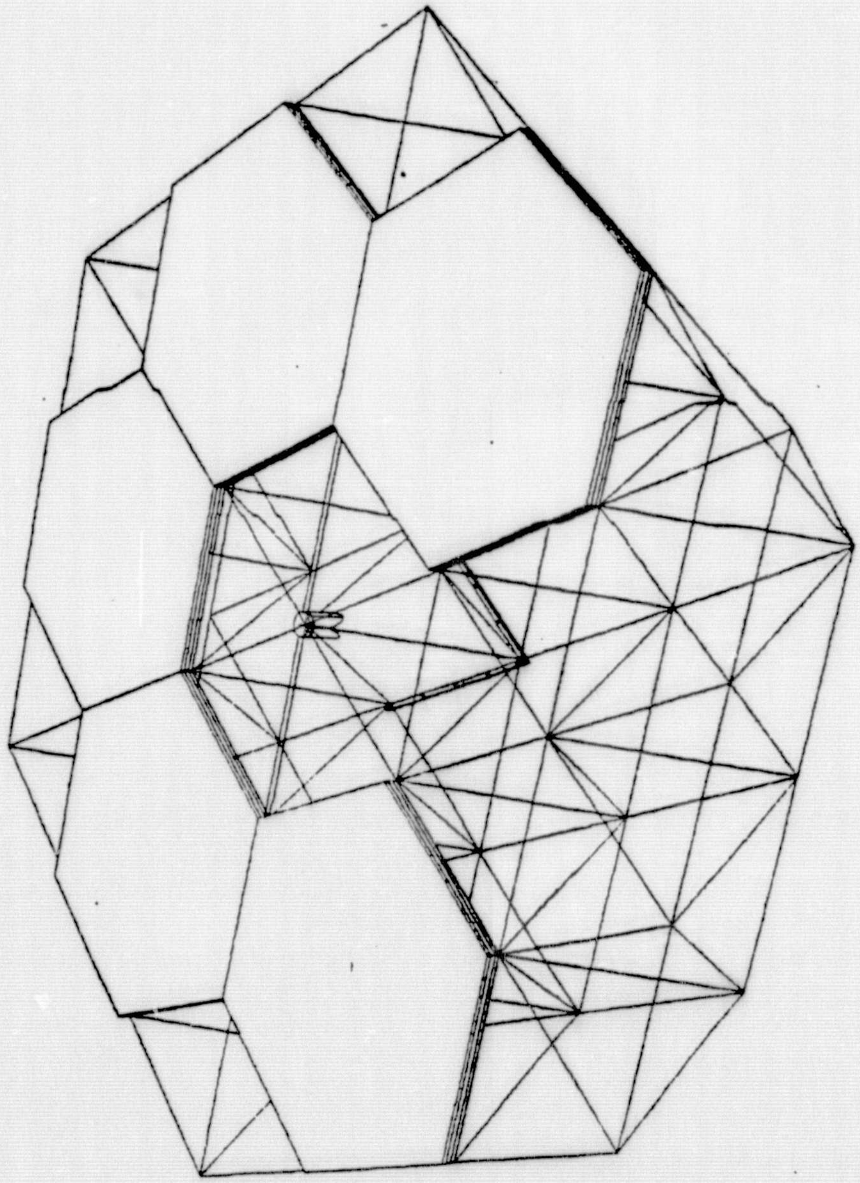
C-3









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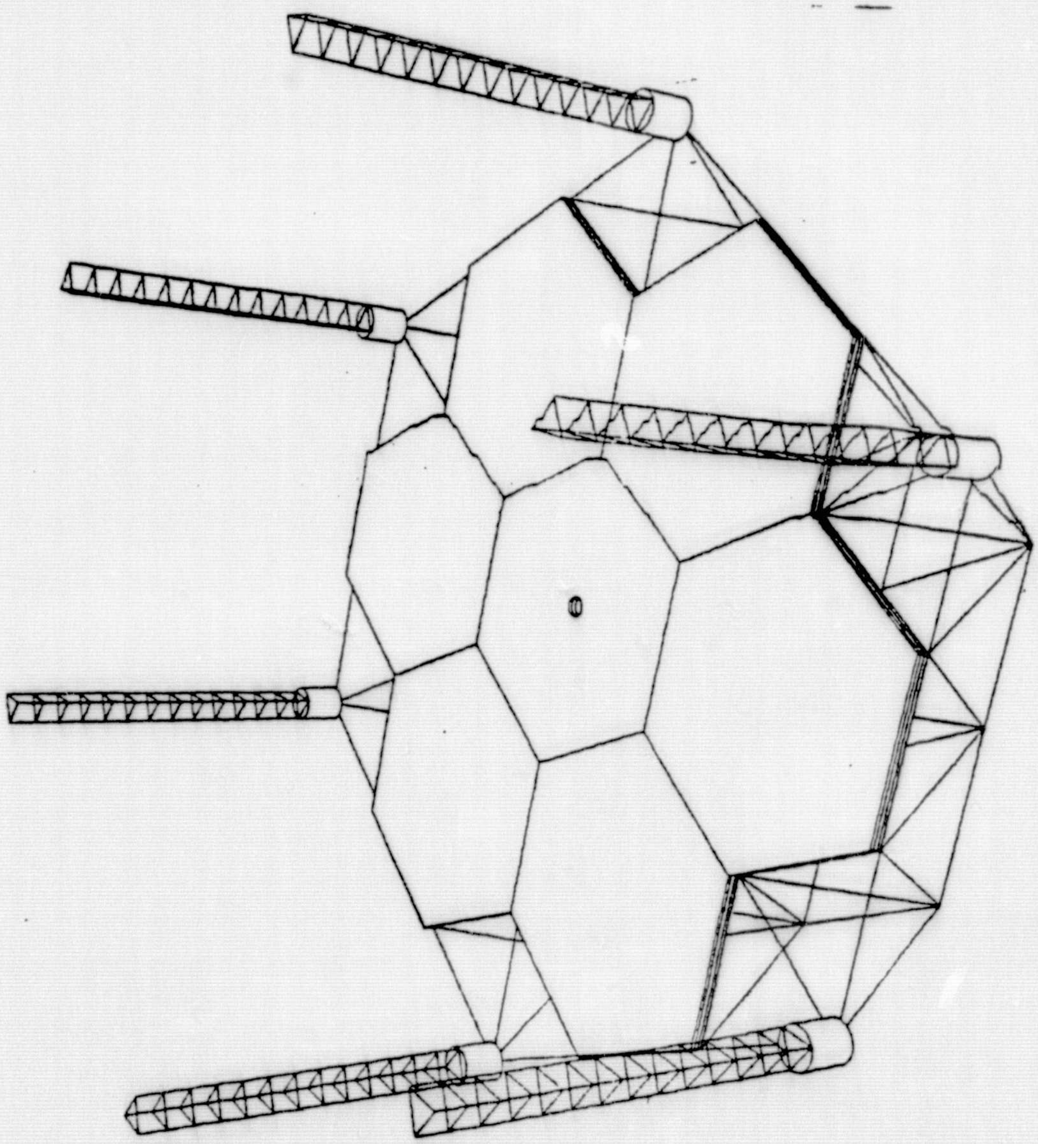

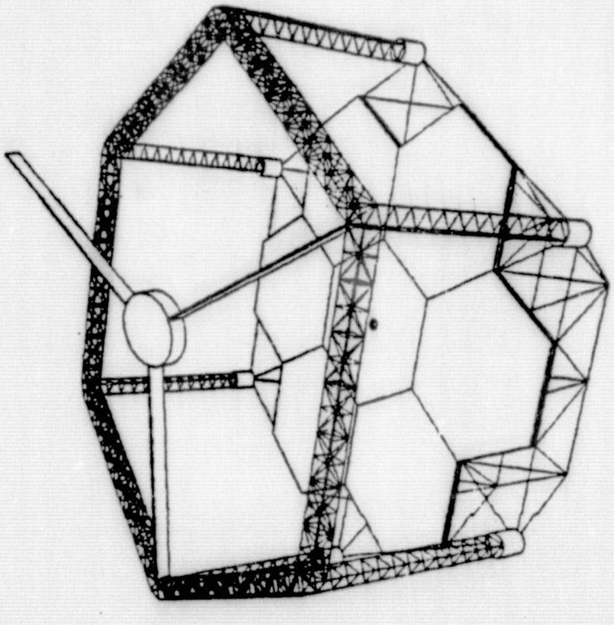

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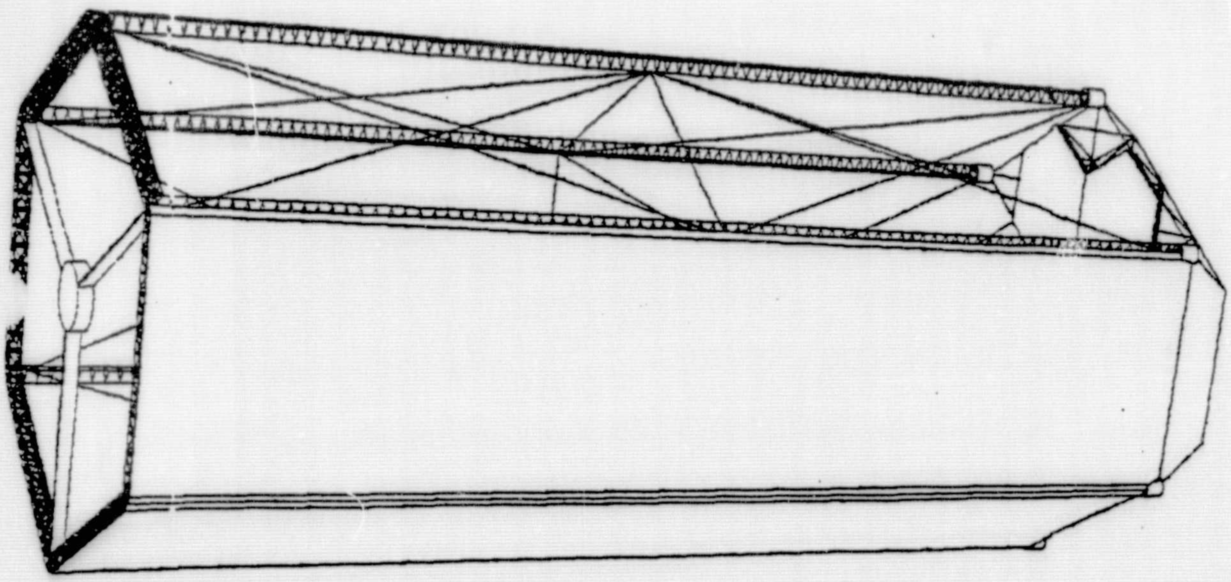

- - - PRICE 84 - -

ELECTRONIC ITEM

DATE 7-MAR-83 TIME 18:55 FILENAME: REID2.DAT

(28301[illegible])

PRECISION OPTICAL SYSTEM

		UNIT WEIGHT	[illegible]880.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	56.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	5702.	-	5702.
DESIGN	18565.	-	18565.
SYSTEMS	3394.	-	3394.
PROJECT MGMT	11671.	-	11671.
DATA	1321.	-	1321.
SUBTOTAL(ENG)	40654.	-	40654.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	26279.	-	26279.
TOOL-TEST EQ	14123.	-	14123.
SUBTOTAL(MFG)	40402.	-	40402.
TOTAL COST	81055.	-	81055.

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              - - - PRICE 84 - -
              ELECTRONIC ITEM

DATE  4-MAR-83          TIME 10:38         FILENAME: REID2.DAT
                        (283010)

PRECISION OPTICAL SYSTEM

                         UNIT WEIGHT   2880.00    MODE            1
PROTOTYPE QUANTITY  3.000  UNIT VOLUME    66.00    QUANTITY-NHA    1

PROGRAM COST($ 1000)    DEVELOPMENT     PRODUCTION     TOTAL COST
 ENGINEERING
   DRAFTING                 5702.           -            5702.
   DESIGN                  18565.           -           18565.
   SYSTEMS                  3394.           -            3394.
   PROJECT MGMT            11671.           -           11671.
   DATA                     1321.           -            1321.
     SUBTOTAL(ENG)         40654.           -           40654.

 MANUFACTURING
   PRODUCTION                 -             -              -
   PROTOTYPE               26279.                       26279.
   TOOL-TEST EQ            14123.                       14123.
     SUBTOTAL(MFG)         40402.                       40402.

     TOTAL COST            81055.           -           81055.

DESIGN FACTORS     ELECTRONIC MECHANICAL    PRODUCT DESCRIPTORS
 WEIGHT              50.000*  2830.000        ENGINEERING COMPLEXITY  0.800
 DENSITY             43.700    32.907*        PROTOTYPE SUPPORT        1.0
 MFG. COMPLEXITY     10.313     8.430         PROTO SCHEDULE FACTOR    .250*
 NEW DESIGN           0.600     0.950         ELECT VOL FRACTION       .013*
 DESIGN REPEAT        0.000     0.000         PLATFORM                2.500
 EQUIPMENT CLASS     *****     *****       YAR OF TECNOLOGY       1987*
 INTEGRATIO LEVEL  0.0        0.0        RELIBILITY FATOR      1.0
                                         MTBF(FIED)             1254*

SCHEDULE            START         FIRST IEM         FINIH
   DVELOPMENT    AN 87   ( 11)   OV 87*  ( 10)     SEP 88*  ( 21)
SUPEBENSRTGDNSMEBBATION  198            TOOLIG & PROCESS ACTORS
ESCALATIO             0.00            DEVEOPMENT TOOLING      0.0
DEVCOST MULTIPIER      .14

 RANGE             DEVLOPMENT     PRODUCTIN       OTAL COST
                                                          FRM              70872.
   CENTER              8055.                      81055.
                                                           [illegible]    [illegible]
```

PAYLOAD ELEMENT NAME	CODE
CONST & STORAGE FAC (LSS-1)	BACX2037

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name RICHARD GATES
Address BOEING AEROSPACE CO
PO BOX 3999
SEATTLE, WA 98124

Telephone 206/773-2020

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 8

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1991 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
LARGE SPACE STRUCTURES TECHNOLOGY DEMONSTRATIONS (DEPLOYMENT AND ASSEMBLY , SUBSYSTEM INSTALLATION AND CHECKOUT, DEMONSTRATION OF MAN'S ROLE AND CAPABILITIES IN SPACE). FOLLOWING THE TDM, THIS STRUCTURE WILL SERVE AS A PERMANENT SPACE STATION FACILITY.

DESCRIPTION
THE CONSTRUCTION AND STORAGE FACILITY IS A LARGE PLANAR, DEPLOYABLE TRUSS ATTACHED TO THE SPACE STATION AT A BERTHING PORT. ADDITIONAL STRUCTURAL SUPPORT STRUCTURES WILL BE ATTACHED TO PROVIDE STRUCTURAL ATTACHMENTS FOR PAYLOADS AND OTHER MODULES TRANSPORTED TO THE SPACE STATION VIA STS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0
Heat Rejection, W Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: 2.50 meters Width: 2.50 meters Height: 1.00 meters (Stowed)
Length: 26.00 meters Width: 12.00 meters Height: 3.50 meters (Deployed)
Launch mass, kg: 2000 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill	11	12	13			
Level	3	3	3			
Hours/Day	0.00	0.00	0.00			

EVA (X) Yes ( ) No Reason CONSTRUCTION Hours/EVA 120

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
AS A TECHNOLOGY DEMONSTRATION MISSION (TDM), REALTIME MONITORING (TV) AND DATA MEASUREMENT EQUIPMENT (STRUCTURAL ACCURACY, DYNAMICS, THERMAL DEFLECTIONS) WILL BE REQUIRED. FOLLOWING THE TDM, PERMANENTLY MOUNTED TV AND AUXILIARY LIGHTING ARE REQUIRED.

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	365 days/year
IVA Service	10 man-days/year
EVA Service	20 man-days/year
Experiment Ops	20 man-days/year
Service Frequency	4 times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	Width:	Height:	
1.00 meters	.50 meters	.50 meters	(Stowed)
3.00 meters	1.00 meters	1.00 meters	(Deployed)

Mass: 100 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	120
Number of Modules Required to Assemble the Payload	2

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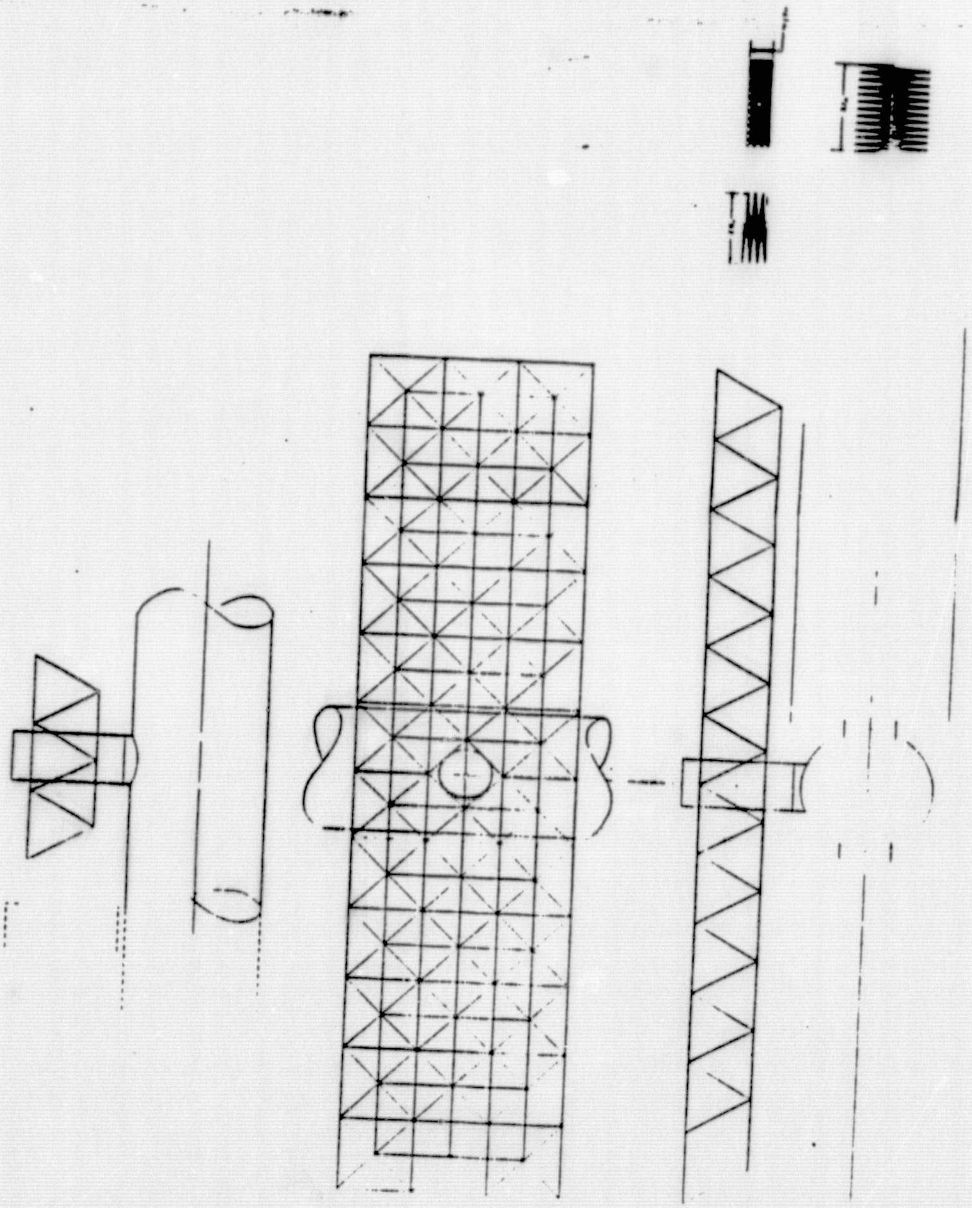

```
TY PCHCIY SPACE1 PCHOUT

START 5

REVISION NINE  (15 FEBRUARY 1982)

CASE SPACE STATION HARDWARE (DEV)
DWRAP 60 95 130 50 120 60 30 15
REMOTE 0 0
ASUPPORT 1 .3 1 .5
BSUPPORT .5 .2 1 1 1
WEIGHT 0 0 5 2860
SCHEDULE 0 0
FINAL 1 0
FLIGHT 0 0
TOOLING 1
SPARES 10
SETS 1
CLASS 0
MILL 1
DEV
         ***  PCM MODEL REVISION NINE        18 FEB 1983  ***

************************************************************************
ENGINEERING  ******  ENGINEERING  ********  ENGINEERING  ******  ENGINEERING
************************************************************************

   $$$$$$$$$$  MILLIONS  $$$$$$$$$$   ********** BOEING **********   SUB/GFE
                                     DESIGN   DEV SHOP  DES & SHOP    TOTAL
                                      HOURS    HOURS     DOLLARS     DOLLARS
                                     ------   --------  ----------   -------
B1  STRUCTURE--SPACE PLATFORM
M7  SPACE PLATFORM 2860 5 1.2 0 0
                                     289531.   86839.     25.623
END
MFG
         ***  PCM MODEL REVISION NINE        18 FEB 1983  ***

************************************************************************
MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING  ****  MANUFACTURING
************************************************************************

   $$$$$$$$$$  MILLIONS  $$$$$$$$$$   ********** BOEING **********   SUB/GFE
                                     B.F.L.      Q.C.   MANUFACTUR    TOTAL
                                      HOURS     HOURS    DOLLARS     DOLLARS
                                     ------    ------  ----------   -------
B1  STRUCTURE--SPACE PLATFORM
M7  SPACE PLATFORM 2860 5 2 0 0
                                      76872.    11531.     10.570
MHC HARDWARE ASSEMBLY & CHECKOUT 0 3 0 0
                                       3985.      398.      0.348
END
         ***  PCM MODEL REVISION NINE        18 FEB 1983  ***

************************************************************************
*** BOEING*BOEING **   PCM  HOURS SUMMARY HOURS  PCM   ** BOEING*BOEING ****
************************************************************************

 TITLE:  SPACE STATION HARDWARE (DEV)
 ------------------------------------------------------------
          BOEING HARDWARE SUBSYSTEM HOURS
                                    DESIGN     DEV SHOP      B.F.L.       Q.C.
                                  ----------  ----------  ----------  ----------
 B1  STRUCTURE--SPACE PLATFOR        289531       86839       80857       12129
                                  ----------  ----------  ----------  ----------
          BOEING SUBTOTAL            289531       86839       80857       12129

                                    HARDWARE ASSEMBLY & C/O       13946

          BOEING SUPPORT HOURS
 SYSTEM ENGINEERING & INTEGRATION          47237
 SOFTWARE ENGINEERING                      12398
```

S1 STRUCTURE--SPACE PLATFOR	289531	86859	80857	12129
BOEING SUBTOTAL	289531	86859	80857	12129

HARDWARE ASSEMBLY & C/O 13948

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	47237
SOFTWARE ENGINEERING	12388
SYSTEMS GROUND TEST CONDUCT	65449
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	13453
SUPPORT EQUIPMENT MFG	9827
TOOLING & SPECIAL TEST EQUIPMENT	9578
SPARES	9299
LIAISON ENGINEERING	8524
DATA	26523
PROGRAM MANAGEMENT (ENG)	87542
PROGRAM MANAGEMENT (MFG)	24109

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BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	376300
BOEING HARDWARE SFL & QC HOURS	106900
BOEING SUPPORT HOURS	313900
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	797200

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: SPACE STATION HARDWARE (DEV)

	--DEVELOPMENTAL--	
	ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
S1 STRUCTURE--SPACE PLATFORM	25.623	11.118
SUBSYSTEM HARDWARE SUBTOTAL ($M)	25.623	11.118
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (S1-S50) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		1.668
HARDWARE SUBTOTAL ($M)		12.786
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	2.834	
SOFTWARE ENGINEERING	1.007	
SYSTEMS GROUND TEST CONDUCT	5.007	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.948	1.025
TOOLING & SPECIAL TEST EQUIPMENT		1.149
SPARES		1.112
LIAISON ENGINEERING	0.511	
DATA	1.591	
PROGRAM MANAGEMENT	6.303	1.446
SUPPORT EFFORT SUBTOTAL ($M)	18.199	4.733
TOTAL ($M) (NOMINAL SCHEDULE)	43.822	17.518

PAYLOAD ELEMENT NAME
MANIPULATOR DEVELOP & TEST FACIL

CODE
BACX2059

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name D. GOSSAIN
Address SPAR AEROSPACE LTD
1700 ORMONT DRIVE
WESTON, ONTARIO, CANADA
M9L2W7

Telephone 416/745-9680

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 7

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1991 Number of Flights 1 Duration of Flight, Days 730

OBJECTIVE
1) TO DEVELOP & REFINE REQUIREMENTS FOR TASKS & FUNCTIONS OF SPACE REMOTE MANIPULATORS BY COLLECTING DATA ON REMOTELY PERFORMED OPERATIONS IN SPACE.
2) TO CONDUCT PERFORMANCE TESTS ON MANIPULATORS DURING THE DEVELOPMENT & VERIFICATION OF SPACE MANIPULATORS.

DESCRIPTION
MANIPULATORS OF DIFFERENT SIZES AND CAPABILITIES WILL BE USED WITH A SET OF TYPICAL PAYLOADS TO PERFORM A NUMBER OF TASKS INVOLVING BERTHING, MODULE INTERCHANGE, SATELLITE SERVICING. DATA ON THESE TASKS WILL BE COLLECTED AND USED TO DEVELOP AND REFINE REQUIREMENTS FOR MANIPULATORS FOR APPLICATIONS IN SPACE CONSTRUCTION, INSPECTION, SATELLITE REPAIR & MATERIAL TRANSFER.
DATA ACQUISITION SYSTEM WILL BE AVAILABLE ON THE SPACE STATION TO CONDUCT PERFORMANCE TESTS ON MANIPULATOR.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes ( ) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth ( ) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	2000	8.00
Standby	200	( ) Continuous
Peak		
Voltage, V	115	Frequency, Hz 400

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime (X) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): Frequency (MHz):

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day

Film (Amount): Voice (Hours/Day):

Live TV (Hours/Day): Other:

On-Board Storage (Mbit): 100.00

Data Dump Frequency (Per Orbit) Downlink command rate:

Recording Rate (KBPS) 10 Downlink Frequency (MHz):

THERMAL

(X) Active (X) Passive

Temperature, deg C Operational Minimum Maximum

Non-operational Minimum Maximum

Heat Rejection, W Operational Minimum Maximum

Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS

Location (X) Internal ( ) External ( ) Remote

Equipment ID/Function ( ) Pressurized ( ) Unpressurized

Length: 17.00 meters Width: 1.00 meters Height: 2.00 meters (Stowed)

Length: 33.00 meters Width: 0.50 meters Height: 0.50 meters (Deployed)

Launch mass, kg: 2500 Return mass, kg: 2500

Consumable Types

Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS

Crew Size Task Assignments

Skills (See Table B)

Skill	5	7									
Level	3	2									
Hours/Day	8.00	8.00									

EVA (X) Yes ( ) No Reason EXTERNAL MANIPULATOR Hours/EVA 240

SERVICING/MAINTENANCE

Service: Interval days Consumables kg

Returnables kg Man hours required

Configuration Changes: Interval days Man-Hours Required

Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	730 days/year
IVA Service	20 man-days/year
EVA Service	40 man-days/year
Experiment Ops	90 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

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PAYLOAD ELEMENT NAME
SHOWER STATION

CODE
EACX2060

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 14

CONTACT
Name
Address

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 8

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1991 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
TO PROVIDE THE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF THE SYSTEM REQUIRED FOR PERSONAL SHOWER, WATER COLLECTION, RECYCLING AND CLEANUP.

DESCRIPTION
THIS MISSION WILL PROVIDE THE CONDITIONS NECESSARY FOR THE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF A ZERO-GRAVITY SHOWER. TESTS WILL ASSESS THE EFFECTIVENESS OF SOAP AND WATER APPLICATION, WATER REMOVAL, SHOWER CLEANUP, AND SHOWER AREA HEATING REQUIREMENTS.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	1000	
Standby		( ) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS

Monitoring Requirements:

(X) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): Frequency (MHz):

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day

Film (Amount): Voice (Hours/Day):

Live TV (Hours/Day): Other:

On-Board Storage (Mbit):

Data Dump Frequency (Per Orbit) Downlink command rate:

Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL

( ) Active ( ) Passive

Temperature, deg C Operational Minimum Maximum

Non-operational Minimum Maximum

Heat Rejection, W Operational Minimum Maximum

Non-operational Minimum Maximum

ORIGINAL PAGE IS OF POOR QUALITY

EQUIPMENT PHYSICAL CHARACTERISTICS

Location (X) Internal ( ) External ( ) Remote

Equipment ID/Function ( ) Pressurized ( ) Unpressurized

Length: 1.50 meters Width: 1.50 meters Height: 1.50 meters (Stoved)

Length: 1.50 meters Width: 1.50 meters Height: 1.50 meters (Deployed)

Launch mass, kg: 25 Return mass, kg:

Consumable Types

Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS

Crew Size Task Assignments

Skills (See Table B)

Skill	1										
Level	1										
Hours/Day	0.50										

EVA ( ) Yes (X) No Reason Hours/EVA

SERVICING/MAINTENANCE

Service: Interval days Consumables kg

Returnables kg Man hours required

Configuration Changes: Interval days Man-Hours Required

Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer
- ( ) Not Serviced — F
- ( ) Remote TMS — FT
- ( ) Remote Manned — FM
- ( ) Serviced at Station (TMS Retrieved) — FST
- ( ) Serviced at Station (Self-propelled) — FS

Platform Based
- ( ) Not Serviced — P
- ( ) Remote TMS — PT
- ( ) Remote Manned — PM
- ( ) Serviced at Station (TMS Retrieved) — PST
- ( ) Serviced at Station (Self-propelled) — PS

Other
- ( ) Space Station Based — SS
- ( ) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	0	days
OTV or TMS on Orbit	0	days
Mission Use	365	days/year
IVA Service	4	man-days/year
EVA Service	0	man-days/year
Experiment Ops	35	man-days/year
Service Frequency	4	times/year

Delta Velocities
- Up
- Down
- Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab

Number of Appendages

Number of Modules Required to Assemble the Payload

Cost Data

Name and Phone Number: C. REID 3-2020

DESCRIPTION
THIS MISSION WILL PROVIDE THE CONDITIONS NECESSARY FOR THE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF A ZERO-GRAVITY SHOWER. TESTS WILL ASSESS THE EFFECTIVENESS OF SOAP AND WATER APPLICATION, WATER REMOVAL, SHOWER CLEANUP, AND SHOWER AREA HEATING REQUIREMENTS.

Item Dry Weight: 150 pounds   Volume: 20.00 cubic feet

Structural Weight (includes typical "mechanical" items listed below): 120.00 pounds

Design Complexity: 5

Manufacturing Complexity for Structural/Mechanical Items: 5
Typical "mechanical" items include enclosures, optics, motors, blowers, gyros, batteries, cables, connectors, switches, indicators, cathode ray tubes, antennas without electronics, mechanisms, waveguides, etc.

Electronic Equipment Description:

Analog	10 %
Digital	20 %
Power Supplies	60 %
Other	10 %

Manufacturing Complexity for Electronic Items: 5

Weight of the Circuit Board and Electronics Mounted on it: 4.00 pounds

Material Used for the Enclosure: STAINLESS   Machine Casting? No

Of the electronics weight, what % is off-the-shelf? 0

Of the sturctural weight, what % is off-the-shelf? 0

Manufacturing Degree of Automation

Electronics	( ) Low	(X) Medium	( ) High
Mechanical	( ) Low	(X) Medium	( ) High

Is the item Hardened? No

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--- PRICE 84 ---
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:48 FILENAME: REID.DAT
(283010)

SHOWER STATION

		UNIT WEIGHT	150.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	20.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	472.	-	472.
DESIGN	1670.	-	1670.
SYSTEMS	389.	-	389.
PROJECT MGMT	643.	-	643.
DATA	82.	-	82.
SUBTOTAL(ENG)	3257.	-	3257.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	414.	-	414.
TOOL-TEST EQ	308.	-	308.
SUBTOTAL(MFG)	722.	-	722.
TOTAL COST	3979.	-	3979.

PAYLOAD ELEMENT NAME
TRASH MANAGEMENT

CODE
BACX2061

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 14

CONTACT
Name
Address

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 6

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1992 Number of Flights 1 Duration of Flight, Days 365

OBJECTIVE
TO PROVIDE THE TECHNOLOGY BASE FOR WASTE MANAGEMENT SYSTEMS REQUIRED FOR PERMANENT HABITABILITY.

DESCRIPTION
THIS MISSION WILL PROVIDE THE CONDITIONS NECESSARY FOR THE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF APPLIANCES AND DISINFECTANTS REQUIRED FOR TRASH DISPOSAL AND CLEANLINESS IN THE SPACE STATION. THIS MISSION CAN BE DEVELOPED AND ACCOMMODATED ON THE INITIAL MODULE FOR CHECKOUT WITH THE TECHNOLOGY TRANSFERRABLE TO THE EVOLUTIONARY GROWTH CONFIGURATION.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	500	0.50
Standby		
Peak		

( ) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum 200 Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location (X) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 1.54 meters Width: 1.54 meters Height: 1.54 meters (Stoved)
Length: 1.50 meters Width: 1.50 meters Height: 1.50 meters (Deployed)
Launch mass, kg: 40 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size Task Assignments

Skills (See Table B)

Skill	1										
Level	1										
Hours/Day	1.00										

EVA ( ) Yes (X) No Reason Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables 1 kg
Returnables kg Man hours required 0.25
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	365 days/year
IVA Service	4 man-days/year
EVA Service	0 man-days/year
Experiment Ops	10 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment
Length: meters Width: meters Height: meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

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--- PRICE 84 ---
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:48 FILENAME: REID.DAT
(283010)

TRASH MANAGEMENT

		UNIT WEIGHT	100.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	6.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	197.	-	197.
DESIGN	628.	-	628.
SYSTEMS	90.	-	90.
PROJECT MGMT	320.	-	320.
DATA	40.	-	40.
SUBTOTAL(ENG)	1274.	-	1274.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	300.	-	300.
TOOL-TEST EQ	198.	-	198.
SUBTOTAL(MFG)	499.	-	499.
TOTAL COST	1773.	-	1773.

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PAYLOAD ELEMENT NAME
PROP TRANSFER TECH DEMO (OTV-1)

CODE
BACX2063

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name JOHN MALONEY
Address GENERAL DYNAMICS
CONVAIR DIVISION

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1992 Number of Flights 1 Duration of Flight, Days 180

OBJECTIVE
OTV SERVICING TECHNOLOGY DEMONSTRATIONS: ZERO-G, NO-LEAKAGE CRYOGENIC CONNECTORS; CHILLDOWN OF FLUID TRANSFER LINES; CHILLDOWN OF RECEIVER TANK; TRANSFER TO OTV TANK; DISCONNECTS.

DESCRIPTION
THIS HARDWARE FOR THIS TDM WOULD BE INTEGRATED WITH THE OTV PROPELLANT STORAGE TDM HARDWARE (SEE BACX2064). THE HARDWARE WILL CONSIST OF CRYOGENIC LINE CONNECTORS, CONTROLS, PUMPS, ETC. UTILIZE LH2 AS TEST CRYO.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	1000	
Standby		(X) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None (X) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): Frequency (MHz):

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day

Film (Amount): Voice (Hours/Day):

Live TV (Hours/Day): Other:

On-Board Storage (Mbit):

Data Dump Frequency (Per Orbit) Downlink command rate:

Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL

(X) Active ( ) Passive

Temperature, deg C Operational Minimum Maximum

Non-operational Minimum Maximum

Heat Rejection, W Operational Minimum Maximum

Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

Length: 7.11 meters Width: 5.00 meters Height: 3.40 meters (Stowed)

Length: 7.11 meters Width: 5.00 meters Height: 3.40 meters (Deployed)

Launch mass, kg: 1064 Return mass, kg:

Consumable Types

Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS

Crew Size 2

Task Assignments

Skills (See Table B)

Skill	10	11									
Level	3	3									
Hours/Day	0.00	0.00									

EVA (X) Yes ( ) No Reason CONDUCT TESTS Hours/EVA 84

SERVICING/MAINTENANCE

Service: Interval days Consumables kg

Returnables kg Man hours required

Configuration Changes: Interval days Man-Hours Required

Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

INTEGRATE THIS TDM WITH DACM2064.

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	14 days/year
IVA Service	2 man-days/year
EVA Service	4 man-days/year
Experiment Ops	10 man-days/year
Service Frequency	2 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 1

PROP TRANSFER 2063

EVA

Perform visual inspection

Connect umbilicals

Check power

Connect transfer lines

Check seals

Check Data & video

Monitor supply tank

Mass Gaging

Chill down transfer lines

- monitor temp
- chill time

Chill down receiving tank

- monitor temp
- chill time

Open transfer valves

Monitor supply tank

- mass gaging
- venting
- sloshing
- pressurization
- temperature
- liquid vapor mix

Monitor transfer lines

- pressure transients
- temperature
- flow rates
- venting

Monitor receiving tank

- temperature
- mass gaging
- propellant present
- liquid vapor mix
- venting
- sloshing
- pressure
- fill time

Close transfer valves

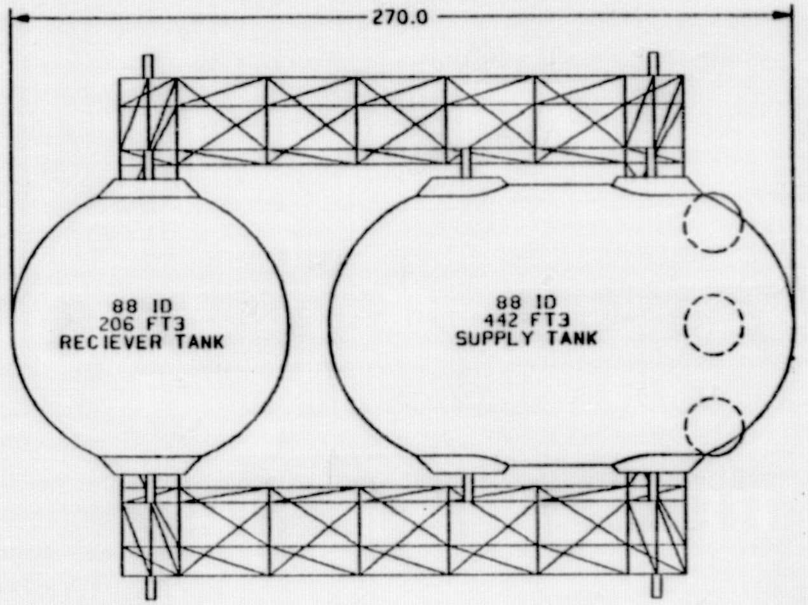
Monitor temp and venting

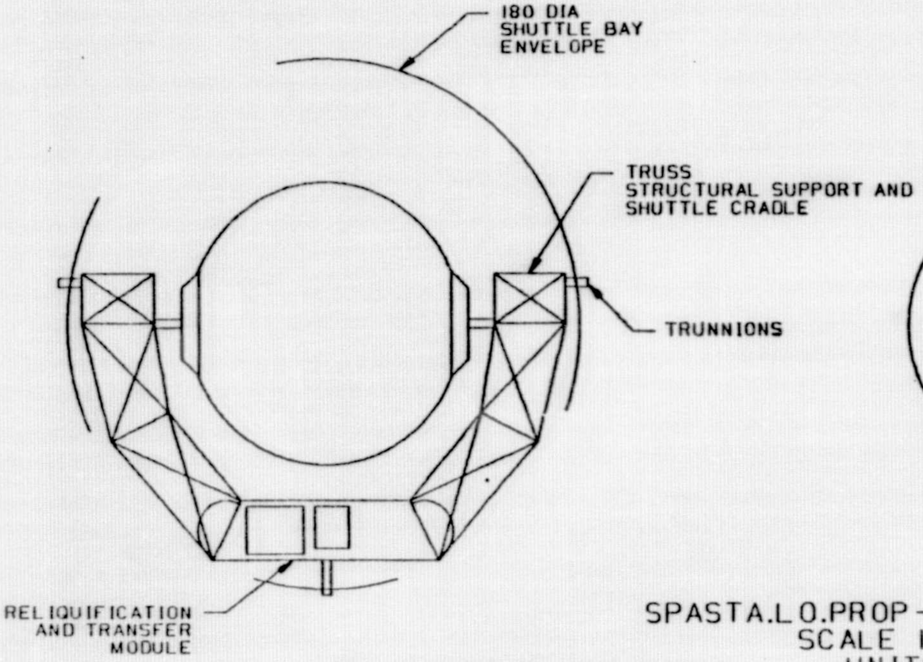
Disconnect lines umbilical

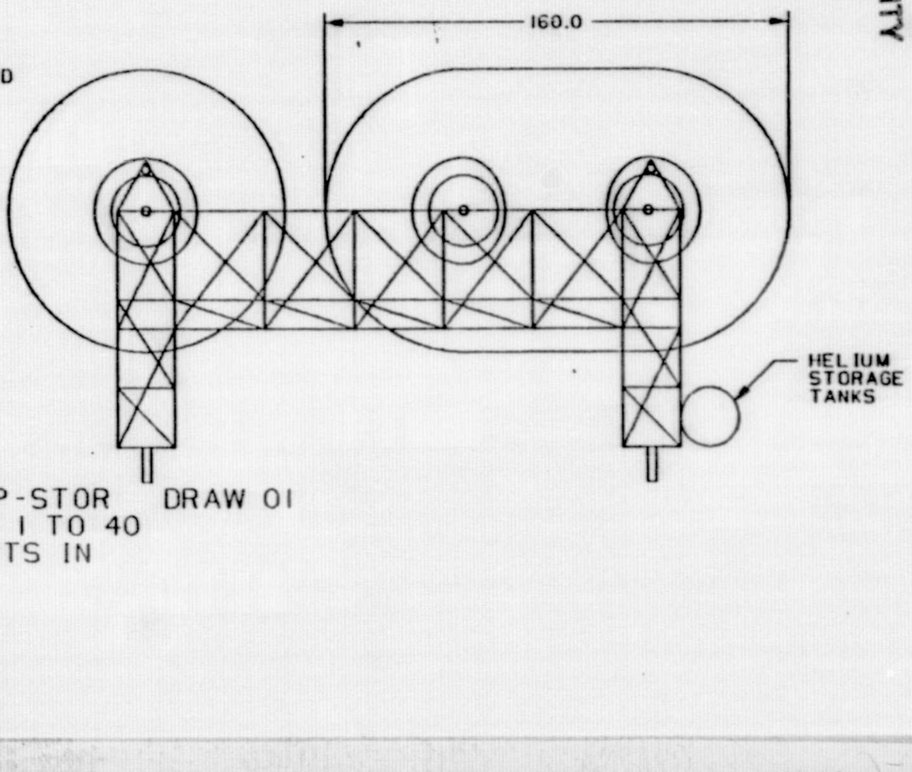
CRYOGENIC PROPELLENT STORAGE AND TRANSFER
CAPABLE OF TRANSFERING PROPELLENT
BETWEEN TANKS AND TO OTV.
CONTAINS INSTRUMENTATION TO
MONITOR STATUS OF ALL PHASES
OF TRANSFER

WEIGHT SUMMARY

TANK AND STRC (DRY)	2060
RELIQ AND TRANS MOD	305
TOT	2365







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T/ SPACE4 PCMOUT

1

START 5

REVISION NINE (15 FEBRUARY 1982)

CASE SPACE STATION HARDWARE (DEV)
DWRAP 60 95 130 50 120 60 30 15
REMOTE 0 0
ASUPPORT 1 .3 1 .3
BSUPPORT .3 .2 1 1 1
WEIGHT 0 0 5 2365
SCHEDULE 0 0
FINAL 1 0
FLIGHT 0 0
TOOLING 1
SPARES 10
SETS 1
CLASS 0
MILL 1
DEV

1

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

0

****
ENGINEERING ****** ENGINEERING ******** ENGINEERING ****** ENGINEERING
****

$$$$$$$$$$ MILLIONS $$$$$$$$$$	********** BOEING **********			SUB/GFE
	DESIGN HOURS	DEV SHOP HOURS	DES & SHOP DOLLARS	TOTAL DOLLARS
B1 STRUCTURE				
M7 TRUSS STRUCTURE 600 5 0 0	63878.	19163.	5.653	
M2 TRUSS SUPPORT 184 5 0 0	4887.	1466.	0.433	
M4 PIPING 100 5 0 0	1992.	397.	0.176	
M3 LARGE TANK 776 5 0 0	16056.	4817.	1.421	
M3 SMALL TANK 400 5 0 0	8727.	2618.	0.772	
M4 RELIQUIFICATION & TRANSFER MOD 300 5 0 0	5484.	1645.	0.485	
B2 ELECTRONICS				
E4 ELECTRONICS 5 5 0 0	934.	280.	0.083	
MIT INTEGRATION & TEST 0 4 0 0	120.	36.	0.011	

END
MFG

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

****
MANUFACTURING **** MANUFACTURING **** MANUFACTURING **** MANUFACTURING
****

$$$$$$$$$$ MILLIONS $$$$$$$$$$	********** BOEING **********			SUB/GFE
	B.F.L. HOURS	Q.C. HOURS	MANUFACTUR DOLLARS	TOTAL DOLLARS
B1 STRUCTURE				
M7 TRUSS STRUCTURE 600 5 2 0 0	20416.	3062.	2.807	
M2 TRUSS SUPPORT 184 5 2 0 0	3055.	458.	0.420	
M4 PIPING 100 5 1.1 2 0 0	2032.	305.	0.279	
M3 LARGE TANK 776 5 1.1 2 0 0	11577.	1736.	1.592	
M3 SMALL TANK 400 5 1.1 2 0 0	6595.	[illegible]	0.907	
M4 RELIQUIFICATION & TRANSFER MOD 300 5 2 0 0	[illegible]	[illegible]	0.647	
B2 ELECTRONICS				
E4 ELECTRONICS 5 5 2 0 0	1061.	[illegible]	[illegible]	
HAC HARDWARE ASSEMBLY & CHECKOUT 0 4 0 0	[illegible]	[illegible]	[illegible]	

H3 LARGE TANK 776 5 1.1 2 0 0	11577.	1736.	1.592
H3 SMALL TANK 400 5 1.1 2 0 0	6595.	989.	0.907
H4 RELIQUIFICATION & TRANSFER MOD 300 5 2 0 0	4706.	706.	0.647
B2 ELECTRONICS			
E4 ELECTRONICS 5 5 2 0 0	1061.	159.	0.146
HAC HARDWARE ASSEMBLY & CHECKOUT 0 4 0 0	75.	11.	0.010

END

*** PCM MODEL REVISION NINE 16 FEB 1983 ***

*** BOEING*BOEING ** PCM HOURS SUMMARY HOURS PCM ** BOEING*BOEING ****

TITLE: SPACE STATION HARDWARE (DEV)

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	S.F.L.	G.C.
B1 STRUCTURE	101025	30307	48382	7257
B2 ELECTRONICS	1055	316	1136	170
BOEING SUBTOTAL	102080	30623	49518	7427

HARDWARE ASSEMBLY & C/O 8542

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	19147
SOFTWARE ENGINEERING	4884
SYSTEMS GROUND TEST CONDUCT	17571
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	2230
SUPPORT EQUIPMENT MFG	1877
TOOLING & SPECIAL TEST EQUIPMENT	8279
SPARES	5694
LIAISON ENGINEERING	5220
DATA	8666
PROGRAM MANAGEMENT (ENG)	30130
PROGRAM MANAGEMENT (MFG)	14551

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	132700
BOEING HARDWARE SFL & GC HOURS	65500
BOEING SUPPORT HOURS	118200
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	316400

*** PCM MODEL REVISION NINE 18 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: SPACE STATION HARDWARE (DEV)

	--DEVELOPMENTAL-- ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
B1 STRUCTURE	8.941	6.652
B2 ELECTRONICS	0.093	0.156
SUBSYSTEM HARDWARE SUBTOTAL ($M)	9.034	6.809
GFE/SUBCON/GIVEN COST ($M)	0.0	0.0
SUBCON/GIVEN (S1-S50) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		1.021
HARDWARE SUBTOTAL ($M)		7.830
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	1.149	
SOFTWARE ENGINEERING	0.396	
SYSTEMS GROUND TEST CONDUCT	1.344	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.157	0.196
TOOLING & SPECIAL TEST EQUIPMENT		[illegible]
SPARES		[illegible]
LIAISON ENGINEERING	0.313	
DATA	[illegible]	
PROGRAM MANAGEMENT	[illegible]	[illegible]
SUPPORT EFFORT SUBTOTAL ($M)	[illegible]	[illegible]
TOTAL ($M) (NOMINAL SCHEDULE)	[illegible]	[illegible]

PAYLOAD ELEMENT NAME
PROP STORAGE TECH DEMO (OTV-2)

CODE
BACX2064

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name JOHN MALONEY
Address GENERAL DYNAMICS
CONVAIR DIVISION

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1992 Number of Flights 1 Duration of Flight, Days 180

OBJECTIVE
OTV SERVICING TECHNOLOGY DEMONSTRATIONS: CONDITION/QTY MONITORING;
INSULATION; SHADOW SHIELDS; METEROID PROTECTION; ACQUISITION; MIXING;
VENTING; RELIQUIFICATION; START/RESTART ENGINE DETANKING.

DESCRIPTION
A PROPELLANT STORAGE TECH DEMO MODULE WOULD CONSIST OF 2 TANKS MOUNTED ON A FRAME WHICH WOULD ATTACH TO THE SPACE STATION. THIS MODULE WOULD INCLUDE GAUGING, INSULATION, SHIELDING, VENTING, PLUMBING, AND CONTROLS. A SEPARATE RELIQUIFICATION MODULE WOULD ATTACH TO THIS PROP STORAGE MODULE.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	1000	
Standby		( ) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

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THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: meters Width: meters Height: meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)
Launch mass, kg: Return mass, kg:
Consumable Types LH2
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size 3 Task Assignments

Skills (See Table B)

Skill	10	11	12							
Level	3	3	3							
Hours/Day	0.00	0.00	0.00							

EVA (X) Yes ( ) No Reason CONDUCT EXPERIMENT Hours/EVA 108

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions
THIS TDM WOULD BE INTEGRATED WITH BACK2063

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
- (X) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	180 days/year
IVA Service	2 man-days/year
EVA Service	4 man-days/year
Experiment Ops	14 man-days/year
Service Frequency	2 times/year

Delta Velocities
- Up
- Down
- Aero Return

Support Equipment

Length: meters	Width: meters	Height: meters	(Stowed)
Length: meters	Width: meters	Height: meters	(Deployed)

Mass: kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

PAYLOAD ELEMENT NAME
RNDZVS,DCKG,BRTHG TECH DEMO (OTV

CODE
BACX2065

CONTACT
Name JOHN MALONEY
Address GENERAL DYNAMICS
CONVAIR DIV

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1993 Number of Flights 1 Duration of Flight, Days 1

OBJECTIVE
OTV SERVICING TECHNOLOGY DEMONSTRATIONS; OTV-TO-SPACE STATION RENDEZVOUS, DOCKING, AND BERTHING.

DESCRIPTION
USE A SPECIALLY MODIFIED TMS AS AN OTV SIMULATOR FOR THIS TDM. THE DOCKING INTERFACE COULD BE A MPA ATTACHED TO THE SPACE STATION OR HANGAR. THIS TDM WOULD DEMONSTRATE OTV STABILITY AND CONTROL, THRUSTERS, AUTOPILOT, COMPUTERS, ACS. UTILIZE THE OTV SIMULATOR FROM BACX2066 FOR BERTHING DEMO'S.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

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THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: meters Width: meters Height: meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)
Launch mass, kg: Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size 2 Task Assignments 15

Skills (See Table B)

Skill	15	11									
Level	3	3									
Hours/Day	0.00	0.00									

EVA (X) Yes ( ) No Reason Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer
( ) Not Serviced — F
( ) Remote TMS — FT
( ) Remote Manned — FM
( ) Serviced at Station (TMS Retrieved) — FST
( ) Serviced at Station (Self-propelled) — FS

Platform Based
( ) Not Serviced — P
( ) Remote TMS — PT
( ) Remote Manned — PM
( ) Serviced at Station (TMS Retrieved) — PST
( ) Serviced at Station (Self-propelled) — PS

Other
(X) Space Station Based — SS
(X) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times
OTV Up/Down — 0 days
OTV or TMS on Orbit — 2 days
Mission Use — 2 days/year
IVA Service — 1 man-days/year
EVA Service — 1 man-days/year
Experiment Ops — 2 man-days/year
Service Frequency — 1 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	1.00	meters	Width:	4.50	meters	Height:	2.00	meters	(Stowed)
Length:	1.00	meters	Width:	4.50	meters	Height:	2.00	meters	(Deployed)

Mass: 370 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

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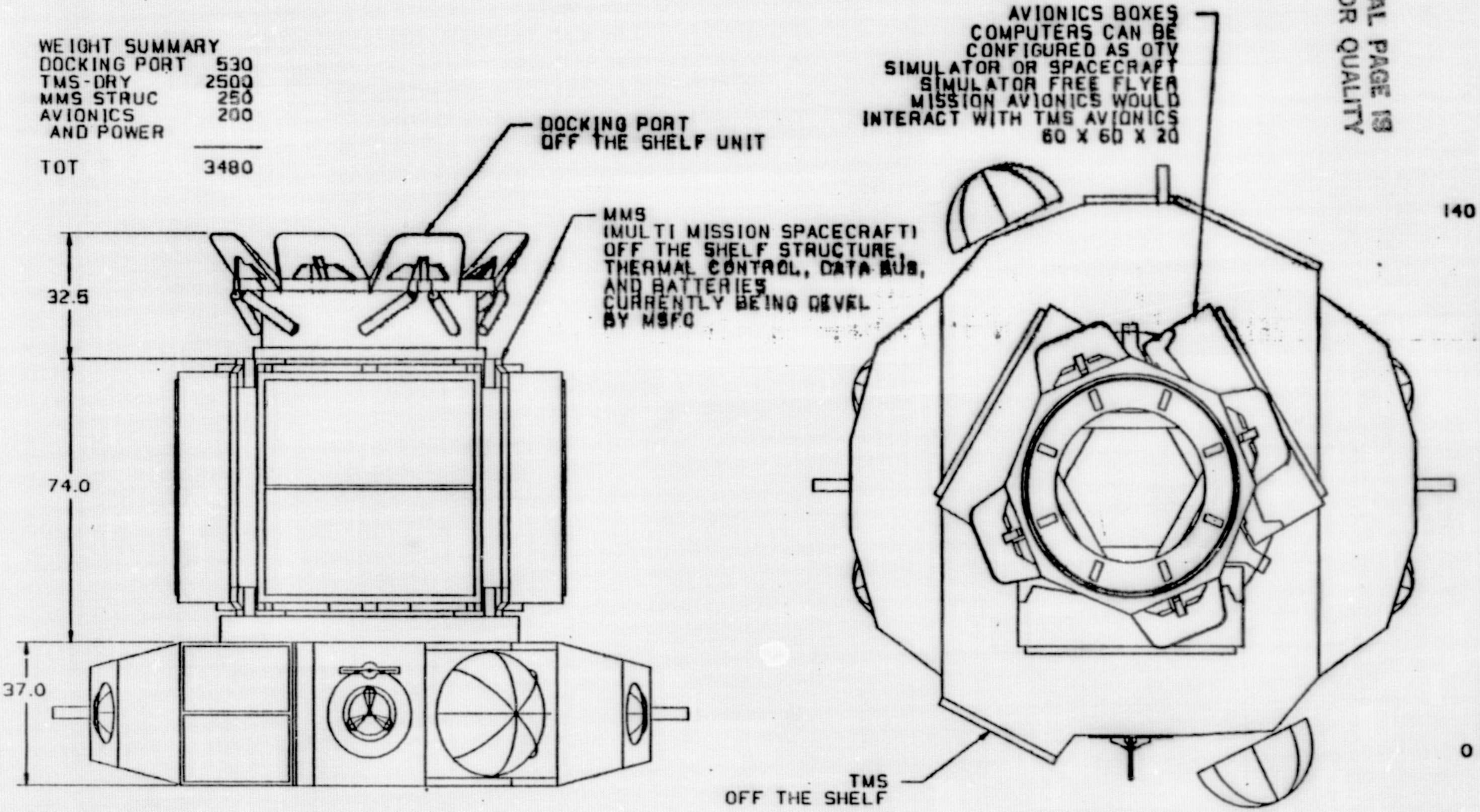
WEIGHT SUMMARY

DOCKING PORT	530
TMS-DRY	2500
MMS STRUC	250
AVIONICS AND POWER	200
TOT	3480



SPASTA.LO.TMS-MMS-DOCKPORT.FOLD
SCALE FULL PICTURE SCALE 1 TO 24
UNIT IN

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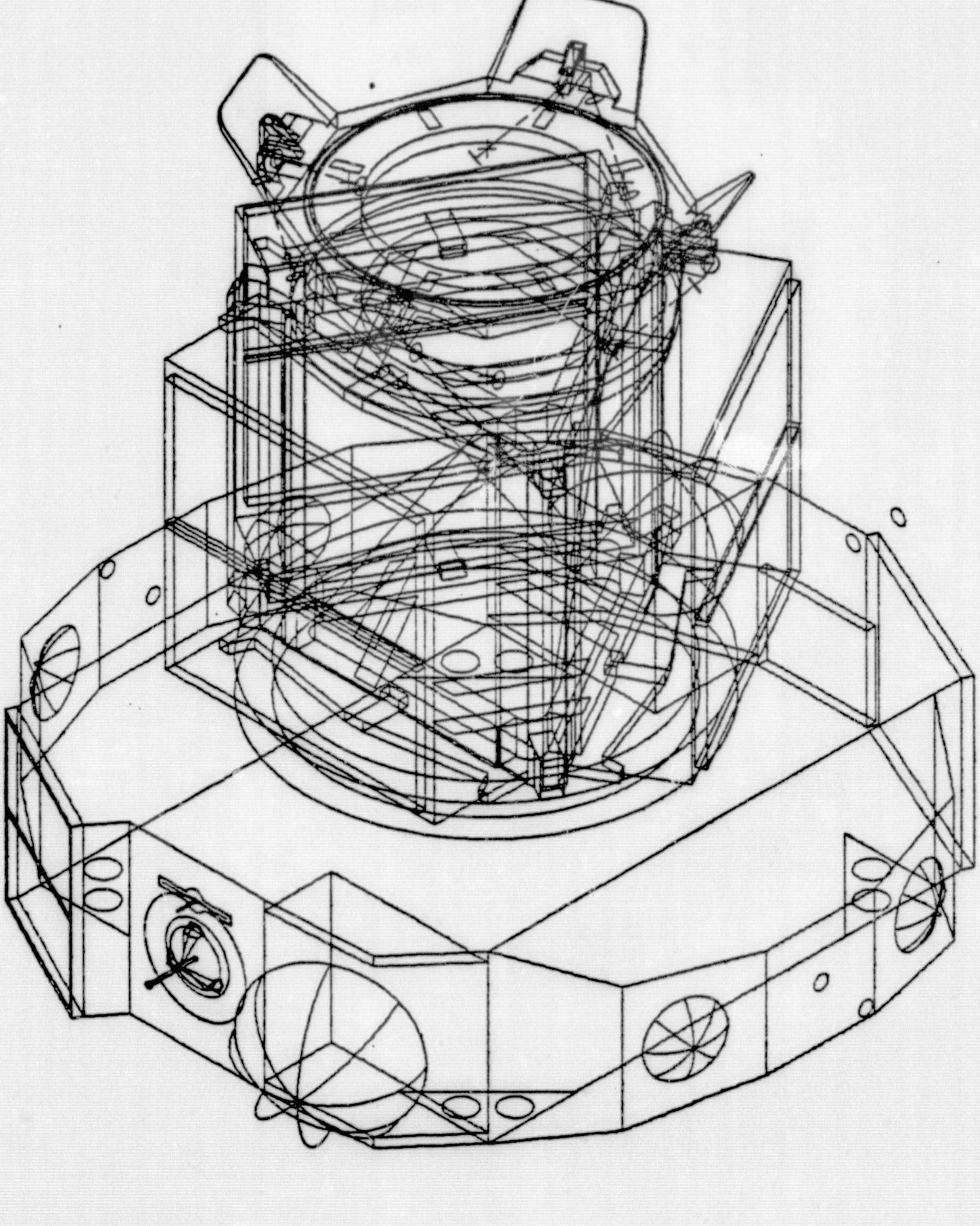

SPASTA.LO.TMS-MMS-DOCKPORT.FOLD
DRAW 02 SCALE 1 TO 24
UNIT IN

PAYLOAD ELEMENT NAME
OTV MAINT TECH DEMO (OTV-4)

CODE
BACX2066

CONTACT
Name JOHN MALONEY
Address GENERAL DYNAMICS
CONVAIR DIV

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1993 Number of Flights 1 Duration of Flight, Days 720

OBJECTIVE
OTV SERVICING TECHNOLOGY DEMONSTRATIONS: MAINTENANCE DOCK HANDLING, HANGAR OPS, INSPECTION, MODULE & COMPONENT REMOVE/REPLACE (ROBOTICS AND EVA).

DESCRIPTION
USE AN OTV SIMULATOR, MAINTENANCE HANGAR (SEE BACX2034), AND CANDIDATE HANDLING SYSTEMS TO DEVELOP OTV MAINTENANCE OPERATIONS AND DEMONSTRATE PROPOSED HARDWARE.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 14.00 meters Width: 4.50 meters Height: 4.50 meters (Stowed)
Length: 14.00 meters Width: 4.50 meters Height: 4.50 meters (Deployed)
Launch mass, kg: 35834 Return mass, kg:
Consumable Types LH2
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill	7	8	9	10	11	12	13			
Level	3	3	3	3	3	3	3			
Hours/Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

EVA (X) Yes ( ) No Reason MAINTENANCE OPS Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions
THE MAINTENANCE HANGAR WOULD BE ASSEMBLED AS A LSS TDM (SEE BACX2034).
THE ROBOTIC MANIPULATOR WOULD BE PROVIDED BY BACX2059 TDM.

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	10 days/year
IVA Service	2 man-days/year
EVA Service	20 man-days/year
Experiment Ops	10 man-days/year
Service Frequency	4 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	2.5	meters	Width:	2.5	meters	Height:	1	meters	(Stowed)
Length:	26	meters	Width:	.2	meters	Height:	3.5	meters	(Deployed)

Mass: 2000 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 1

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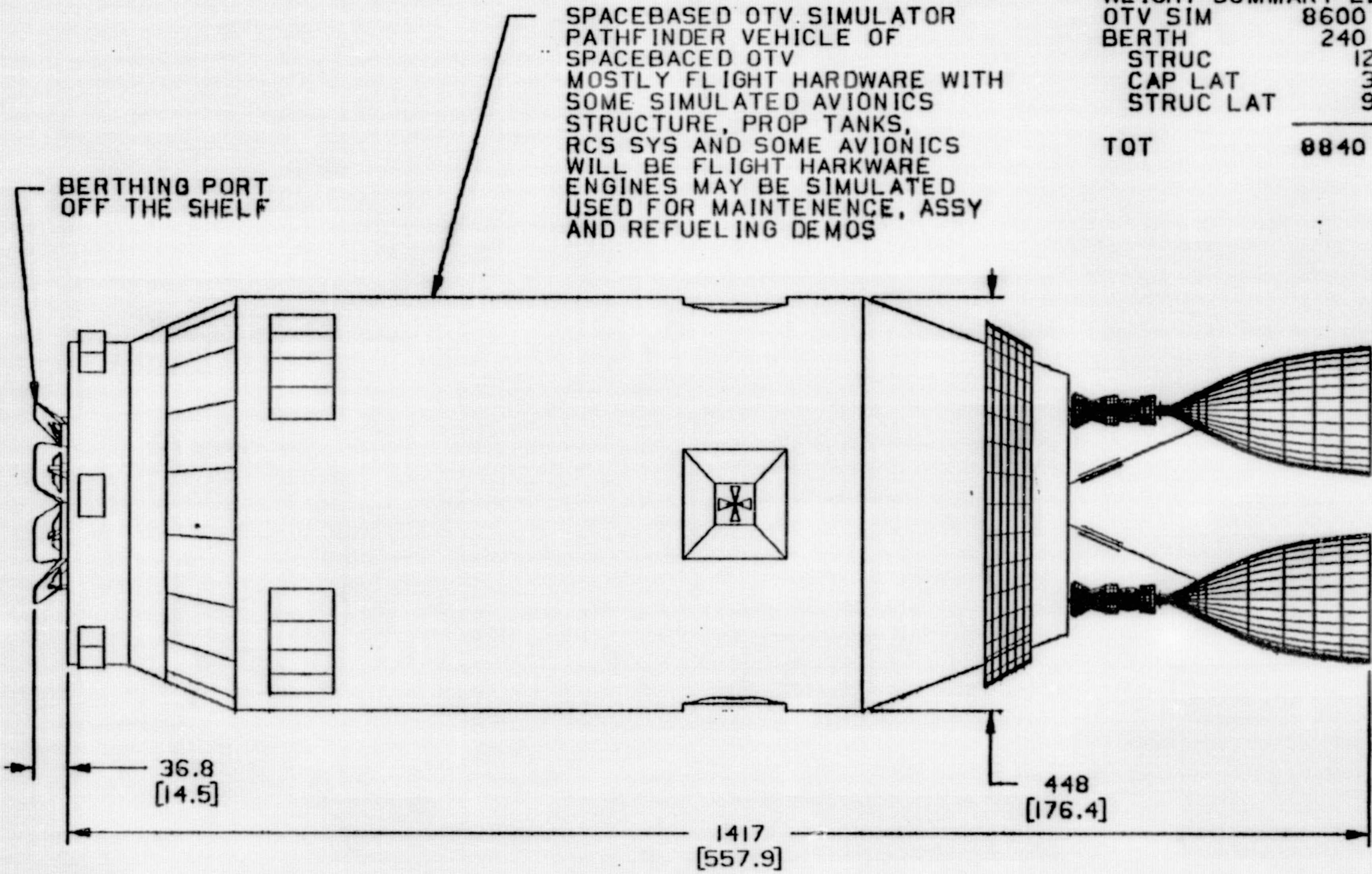

WEIGHT SUMMARY LBS		
OTV SIM	8600	
BERTH	240	
STRUC		120
CAP LAT		30
STRUC LAT		90
TOT	8840	

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SPASTA.LO.OTV-BERTHPORT
DRAW 01
UNITS: PRIM CM, SECND IN

PAYLOAD ELEMENT NAME
PAYLOAD/OTV INTEG TECH DEMO (OTV

CODE
BACX2067

CONTACT
Name JOHN MALONEY
Address GENERAL DYNAMICS
CONVAIR DIV

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1994 Number of Flights 1 Duration of Flight, Days 30

OBJECTIVE
OTV SERVICING TECHNOLOGY DEMONSTRATIONS: PAYLOAD-TO-OTV HANDLING; MATING; CHECKOUT; REMOVE/REPLACE COMPONENTS; DEMATE.

DESCRIPTION
USE A PAYLOAD SIMULATOR MODULE IN CONJUNCTION WITH THE OTV SIMULATOR AND HANDLING EQUIPMENT FROM BACX2066 TO CONDUCT DEMONSTRATIONS OF CAPABILITIES LISTED IN OBJECTIVE.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: meters Width: meters Height: meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)
Launch mass, kg: Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill	7	8	9	10	11	12	13			
Level	3	3	3	3	3	3	3			
Hours/Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

EVA (X) Yes ( ) No Reason ASSEMBLY OPS Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions
THIS TDM WOULD UTILIZE HARDWARE FROM BACM2066.

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer
( ) Not Serviced — F
( ) Remote TMS — FT
( ) Remote Manned — FM
( ) Serviced at Station (TMS Retrieved) — FST
( ) Serviced at Station (Self-propelled) — FS

Platform Based
( ) Not Serviced — P
( ) Remote TMS — PT
( ) Remote Manned — PM
( ) Serviced at Station (TMS Retrieved) — PST
( ) Serviced at Station (Self-propelled) — PS

Other
(X) Space Station Based — SS
(X) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times
OTV Up/Down — 0 days
OTV or TMS on Orbit — 0 days
Mission Use — 30 days/year
IVA Service — 4 man-days/year
EVA Service — 0 man-days/year
Experiment Ops — 6 man-days/year
Service Frequency — 1 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	2.00	meters	Width:	4.50	meters	Height:	2.50	meters	(Stowed)
Length:	2.00	meters	Width:	4.50	meters	Height:	2.50	meters	(Deployed)

Mass: 500 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

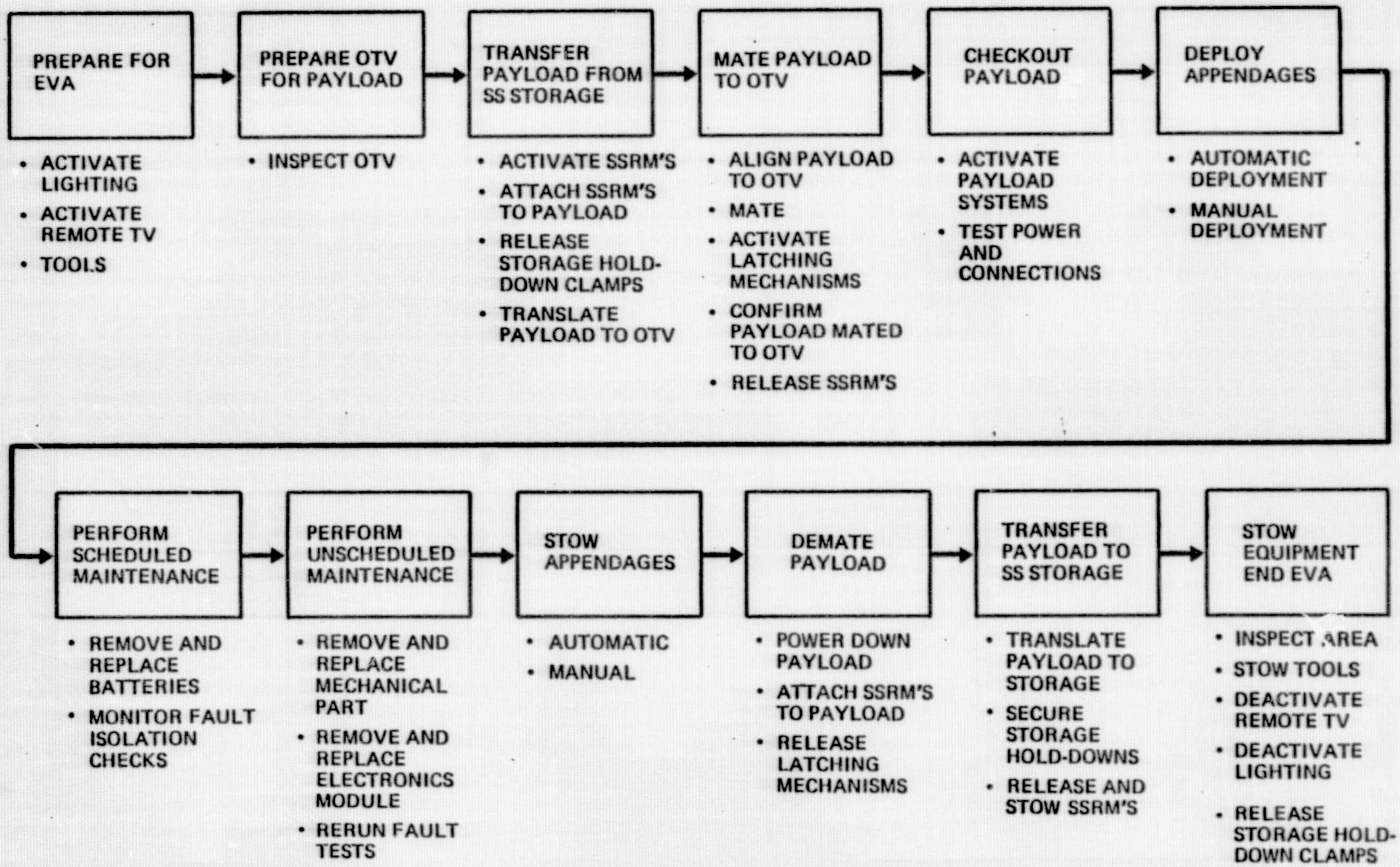
Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

ORIGINAL PAGE IS OF POOR QUALITY

PAYLOAD/OTV INTEGRATION

EVA
Select lighting
Secure tools
Inspect OTV
Determine ready to mate to SS
Activate Rms
Attach Rms to SAT
Release SAT hold down clamps
Maneuver SAT to OTV mating interface
Align SAT and OTV
Activate OTV pull-down and Hold mech
Confirm P/L OTV mate
Release Rms from SAT
Retract Rms
Activate SAT systems
Deploy SAT antennas and appendages
Monitor test progress
Checkout electronics
Identify faulty mechanical or electrical components
Remove defective unit
Stow defective unit
Obtain spare from stowage
Replace unit
Confirm SAT operational
Inspect SAT, determine ready to demate
Activate Rms
Attach Rms to SAT
Release OTV SAT hold down clamps
Guide SAT from OTV with Rms
Maneuver SAT to storage area
Position SAT on hold downs
Secure SAT
Release Rms
Stow Rms
Stow tools
Deactivate lights
End EVA

FUNCTIONAL FLOW PAYLOAD OTV INTEGRATION TECHNICAL DEMONSTRATION



PAYLOAD ELEMENT NAME
CLOSED ECLS FOR SPACE STATION

CODE
BACH2068

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name HARLAN F. BROSE
Address HAMILTON STANDARD,
BRADLEY FIELD RD
WINDSOR LOCKS, CT 06096

Telephone 203/623-1621

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved (X) Planned ( ) Candidate ( ) Opportunity

Desired First Flight, Year: 1991 Number of Flights 2 Duration of Flight, Days 130

OBJECTIVE
DEMONSTRATE THE ABILITY TO ELIMINATE THE NEED TO RESUPPLY WATER AND METABOLIC OXYGEN FOR SPACE STATION CREW SUPPORT.

DESCRIPTION
THE WATER FROM CREW HYGIENE USES, CLOTHING AND DISHWASHING, AND FROM CREW URINE, RESPIRATION AND PERSPIRATION SOURCES MUST BE PROCESSED TO CLEAN WATER FOR REUSE IN ORDER TO ELIMINATE A LARGE RESUPPLY PENALTY. CARBON DIOXIDE MUST BE CONCENTRATED AND REDUCED TO OBTAIN OXYGEN FOR CREW METABOLIC NEEDS IN ORDER TO ELIMINATE ANOTHER LARGE RESUPPLY PENALTY.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg
Escape dV Required, m/s
Ephemeris Accuracy, m

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	2000	
Standby	100	(X) Continuous
Peak	4000	
Voltage, V	28	Frequency, Hz 400

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime (X) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit): 1.00
Data Dump Frequency (Per Orbit) 1 Downlink command rate:
Recording Rate (KBPS) 15.00 Downlink Frequency (MHz):

THERMAL
(X) Active (X) Passive

Temperature, deg C	Operational Minimum	2	Maximum	35
	Non-operational Minimum		Maximum	
Heat Rejection, W	Operational Minimum	800	Maximum	1000
	Non-operational Minimum	100	Maximum	150

ORIGINAL PAGE IS OF POOR QUALITY

EQUIPMENT PHYSICAL CHARACTERISTICS
Location (X) Internal (X) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 3.00 meters Width: 2.00 meters Height: 1.00 meters (Stowed)
Length: 3.00 meters Width: 2.00 meters Height: 1.00 meters (Deployed)
Launch mass, kg: 350 Return mass, kg:
Consumable Types CHEMICALS, FILTERS, SPARES
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size 2 Task Assignments MAINTAIN

Skills (See Table B)

Skill	5	9								
Level	1	2								
Hours/Day	1.00	1.00								

EVA (X) Yes ( ) No Reason INSTALL Hours/EVA 60

SERVICING/MAINTENANCE

Service:	Interval	1	days	Consumables	100	kg
	Returnables	225	kg	Man hours required	1.00	
Configuration Changes:	Interval	1	days	Man-Hours Required	1.00	
	Deliverables	100	kg	Returnables		kg

SPECIAL CONSIDERATIONS/See instructions
THE CREW BY THEIR PRESENCE PROVIDES THE INPUT TO THE EXPERIMENT.

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times	
OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	130 days/year
IVA Service	10 man-days/year
EVA Service	10 man-days/year
Experiment Ops	130 man-days/year
Service Frequency	times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment				
Length: meters	Width: meters	Height: meters	(Stowed)
Length: meters	Width: meters	Height: meters	(Deployed)
Mass: kg			

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

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- - - PRICE 84 - - -
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:49 FILENAME: REID.DAT
(283010)

CLOSED ECTLS FOR SPACE STATION

		UNIT WEIGHT	1870.00	MODE	1
PROTOTYPE QUANTITY	2.000	UNIT VOLUME	215.60	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	5021.	-	5021.
DESIGN	20097.	-	20097.
SYSTEMS	8754.	-	8754.
PROJECT MGMT	11681.	-	11681.
DATA	1597.	-	1597.
SUBTOTAL(ENG)	47149.	-	47149.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	11074.	-	11074.
TOOL-TEST EQ	9495.	-	9495.
SUBTOTAL(MFG)	20569.	-	20569.
TOTAL COST	67718.	-	67718.

Function:

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PAYLOAD ELEMENT NAME
SOLAR ARRAY ADDITION TECH DEMO (

CODE
BACM2069

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 11

CONTACT
Name KEITH MILLER
Address BOEING AEROSPACE

Telephone 206/773-8150

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1992 Number of Flights 1 Duration of Flight, Days 2

OBJECTIVE
SATELLITE SERVICING TECHNOLOGY DEMONSTRATION: DEMONSTRATE CAPABILITY TO ADD ADDITIONAL SOLAR ARRAY TO SPACE STATION BY STRUCTURAL AND ELECTRICAL MODIFICATIONS.

DESCRIPTION
DURING A LULL IN SPACE STATION MISSION ACTIVITY WHEN IT IS FEASIBLE TO POWER-DOWN THE STATION TO WHERE ONLY ONE SOLAR ARRAY WING IS NECESSARY TO PROVIDE THIS STATION'S POWER, CONDUCT THIS TECH DEMO. DEMONSTRATE CAPABILITY TO RETRACT SOLAR ARRAY, DISCONNECT ONE OF THE SOLAR ARRAYS AND THEN MOVE IT TO A STORAGE LOCATION. BRING IT BACK AND REINSTALL. PERFORM NECESSARY FUNCTION TESTS AND REDEPLOY AND REACTIVATE THE SOLAR ARRAY.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY
Escape dV Required, m/s Ephemeris Accuracy, m

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC
Power, W Duration, Hrs/Day
Operating
Standby
Peak ( ) Continuous
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: meters Width: meters Height: meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)
Launch mass, kg: Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size Task Assignments

Skills (See Table B)

Skill	11	12	13							
Level	3	3	3							
Hours/Day	0.00	0.00	0.00							

EVA (X) Yes ( ) No Reason MAINTENANCE DEMO Hours/EVA 6

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions
NO REPLACEMENT SOLAR ARRAY MODULE WOULD BE REQUIRED. THIS IS AN OPERATIONAL TEST THAT WOULD REQUIRE NO LAUNCHED MASS.

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

	OPS CODE
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	1 days/year
IVA Service	1 man-days/year
EVA Service	1 man-days/year
Experiment Ops	1 man-days/year
Service Frequency	1 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions
( ) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must Have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

ORIGINAL PAGE IS OF POOR QUALITY

SOLAR ARRAY ADDITION 2069

IVA

Power down solar array

Install locks

EVA

Get tools

Select lighting

Retract one solar array

Inspect for damage

Disconnect one section

Attach RMS

Remove one section

Move solar array to storage area

Position solar array

Secure solar array

Disconnect Rms

Stow Rms

Reactivate Rms

Move to solar array

Attach RMS to solar array

Release solar array from hold downs

Transport solar array section to solar array boom

Position solar array section on boom

Secure station to boom

Release RMS

Stow Rms

Cable up section

Verify operation of solar array

Extend solar array

Stow tools

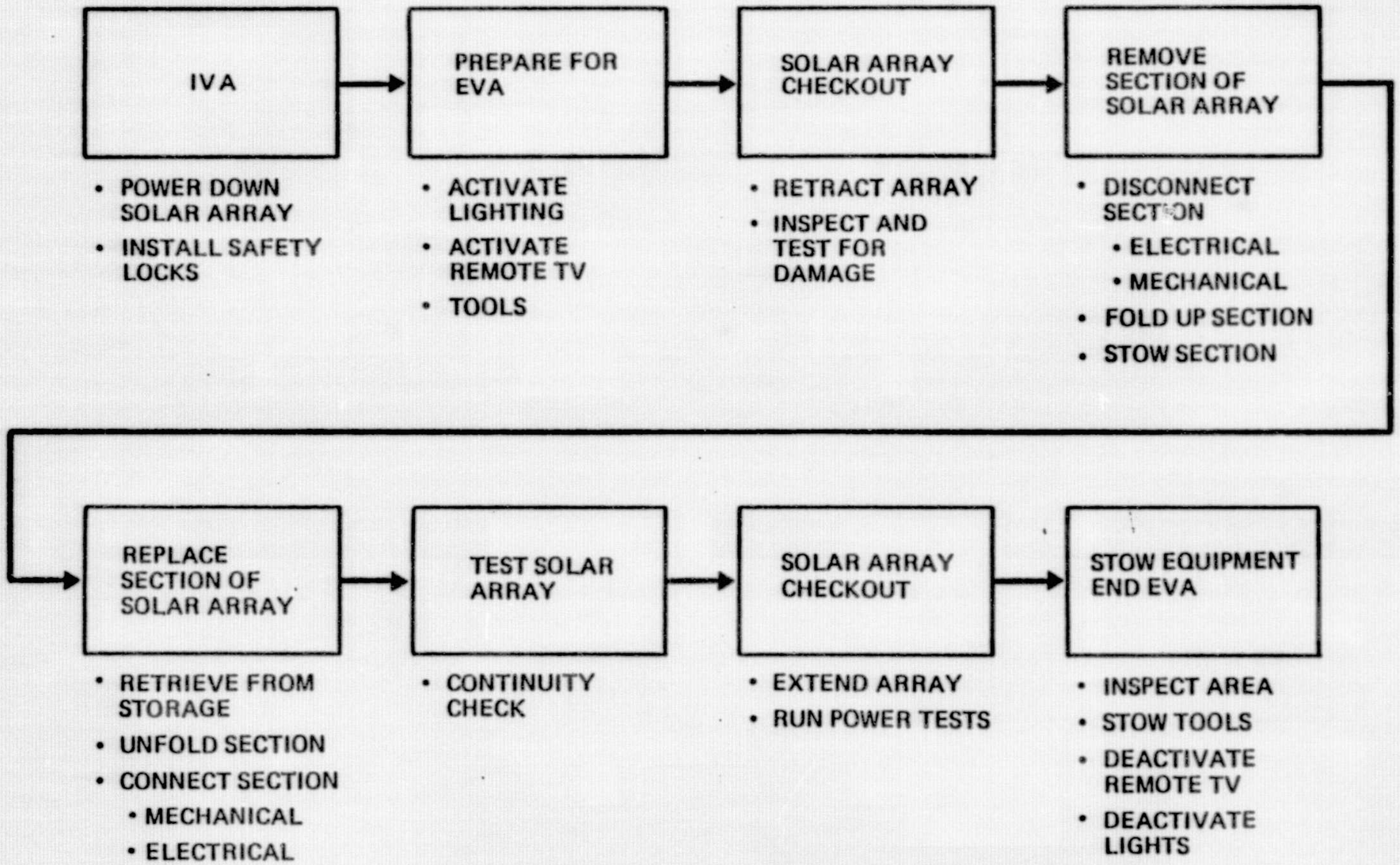
Deactivate lighting

End EVA

Unlock power panel

Activate solar array

FUNCTIONAL FLOW SOLAR ARRAY ADDITION TECHNICAL DEMONSTRATION



PAYLOAD ELEMENT NAME
FORMATION FLYING TECH DEMO (SS-2

CODE
BACX2070

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name KEITH MILLER
Address BOEING AEROSPACE CO

Telephone 206/773-8150

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1994 Number of Flights 1 Duration of Flight, Days 30

OBJECTIVE
SATELLITE SERVICING TECHNOLOGY DEMONSTRATION: DEMONSTRATE CAPABILITY FOR SPACE STATION TO DIRECT AND COORDINATE FORMATION FLYING MANEUVERS OF CO-ORBITING SPACECRAFT.

DESCRIPTION
USE A TMS AS A FREE-FLYER SIMULATOR. CONFIGURE THE COMMUNICATIONS, SUBSYSTEM AND SOFTWARE TO MIMIC A FREE-FLYER SATELLITE'S CHARACTERISTICS. LAUNCH THE TMS FROM THE SPACE STATION AND FLY IT TO SUCCESIVELY FURTHER DISTANT STATION-KEEPING LOCATIONS. USE THE SPACE STATION'S COMM AND NAV SYSTEMS TO COMMAND AND CONTROL THE TMS'S STATION-KEEPING MANEUVERS.

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

ORIGINAL PAGE IS OF POOR QUALITY

THERMAL
( ) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: 1.00 meters Width: 4.00 meters Height: 4.00 meters (Stowed)
Length: meters Width: 4.00 meters Height: 4.00 meters (Deployed)
Launch mass, kg: 3440 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size Task Assignments

Skills (See Table B)

Skill	7	8	11								
Level	3	3	3								
Hours/Day	0.00	0.00	0.00								

EVA ( ) Yes ( ) No Reason PREPARE SATELLITE Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
(X) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
(X) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times	
OTV Up/Down	0 days
OTV or TMS on Orbit	2 days
Mission Use	2 days/year
IVA Service	2 man-days/year
EVA Service	2 man-days/year
Experiment Ops	10 man-days/year
Service Frequency	1 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	1.00	meters	Width:	4.50	meters	Height:	2.50	meters	(Stowed)
Length:	1.00	meters	Width:	4.50	meters	Height:	2.50	meters	(Deployed)

Mass: 370 kg

Manifest Restrictions
( ) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must Have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

ORIGINAL PAGE IS
OF POOR QUALITY

PAYLOAD ELEMENT NAME
SATELLITE ASSY TECH DEMO (SS-3)

CODE
BACX2071

CONTACT
Name KEITH MILLER
Address BOEING AEROSPACE
206/773-8150

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1994 Number of Flights 1 Duration of Flight, Days 1095

OBJECTIVE
SATELLITE SERVICING TECHNOLOGY DEMONSTRATION: DEMONSTRATE CAPABILITIES TO ASSEMBLE SPACECRAFT FROM MODULES DEPLOY APPENDAGES, TEST AND CHECK-OUT SATELLITE, AND PERFORM DISASSEMBLY OF S/C FOR RETURN TO GROUND.

DESCRIPTION
CONFIGURE A SPACE STATION SATELLITE ASSEMBLY TECH DEMO SPACECRAFT FROM SPACE PARTS FROM ONE OR MORE SATELLITE PRODUCTION PROGRAMS. THE TECH DEMO SPACECRAFT SHOULD BE MODULAR, HAVE SEVERAL DEPLOYABLE APPENDAGES, AND HAVE ACTIVE AVIONICS, AND WOULD HAVE A MATERIALS PROCESSING MODULE SIMULATOR. A VARIETY OF APPENDAGE DEPLOYMENT CONCEPTS (AUTOMATIC, MANUAL, ETC.) COULD BE TRIED OUT. THIS HARDWARE WOULD BE DELIVERED TO THE SPACE STATION WHERE IT WOULD THEN BE ASSEMBLED, TESTED, DISASSEMBLED AND RETURNED TO THE GROUND. THIS TEST ARTICLE WILL ALSO BE USED IN THE SS-5 TECH DEMO.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

ORIGINAL PAGE IS OF POOR QUALITY

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: 4.50 meters Width: 4.50 meters Height: 7.90 meters (Stowed)
Length: 8.00 meters Width: 8.00 meters Height: 11.50 meters (Deployed)
Launch mass, kg: 2640 Return mass, kg: 2640
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size Task Assignments

Skills (See Table B)

Skill	7	8	9	10	11	12	13			
Level	3	3	3	3	3	3	3			
Hours/Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00			

EVA (X) Yes ( ) No Reason ASSEMBLY DEMO Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions
THIS TEST ARTICLE WILL ALSO BE USED IN THE SS-5 TECH DEMO MISSION (TACM2073).

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	180 days/year
IVA Service	4 man-days/year
EVA Service	90 man-days/year
Experiment Ops	90 man-days/year
Service Frequency	0 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length: 2.50 meters	Width: 2.50 meters	Height: 1.00 meters	(Stowed)
Length: 26.0 meters	Width: 12.0 meters	Height: 3.50 meters	(Deployed)

Mass: 2000 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages 5
Number of Modules Required to Assemble the Payload 6

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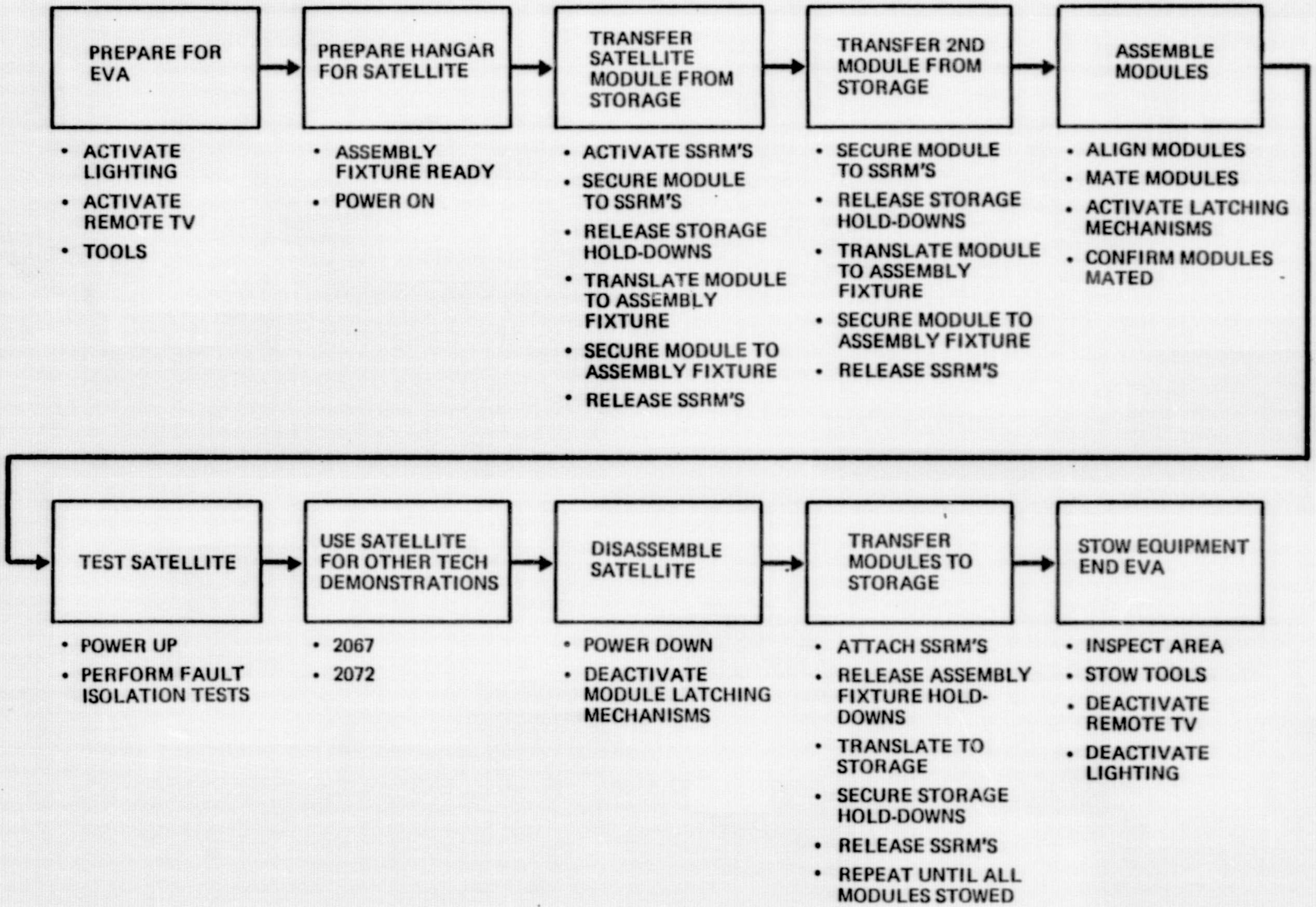
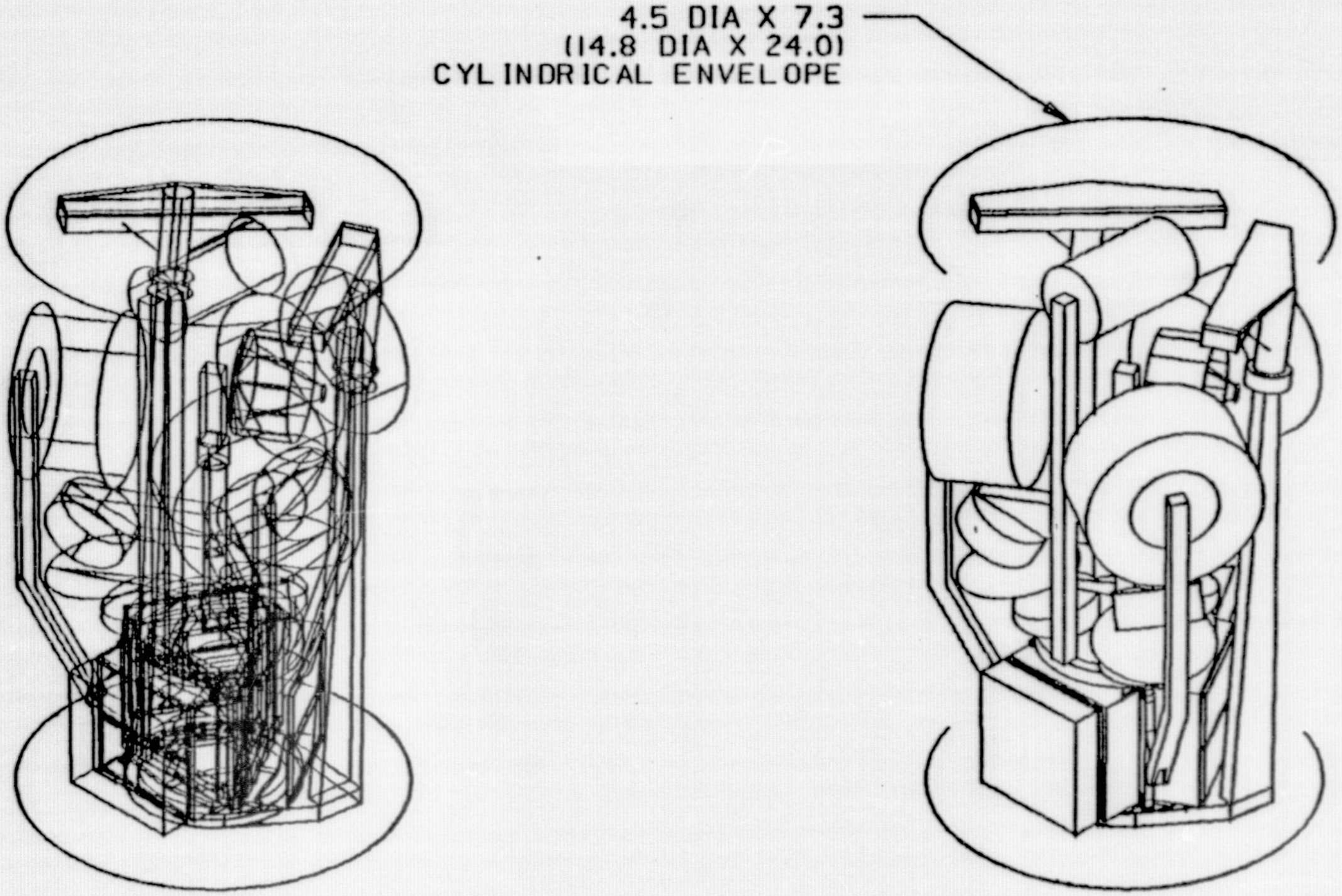
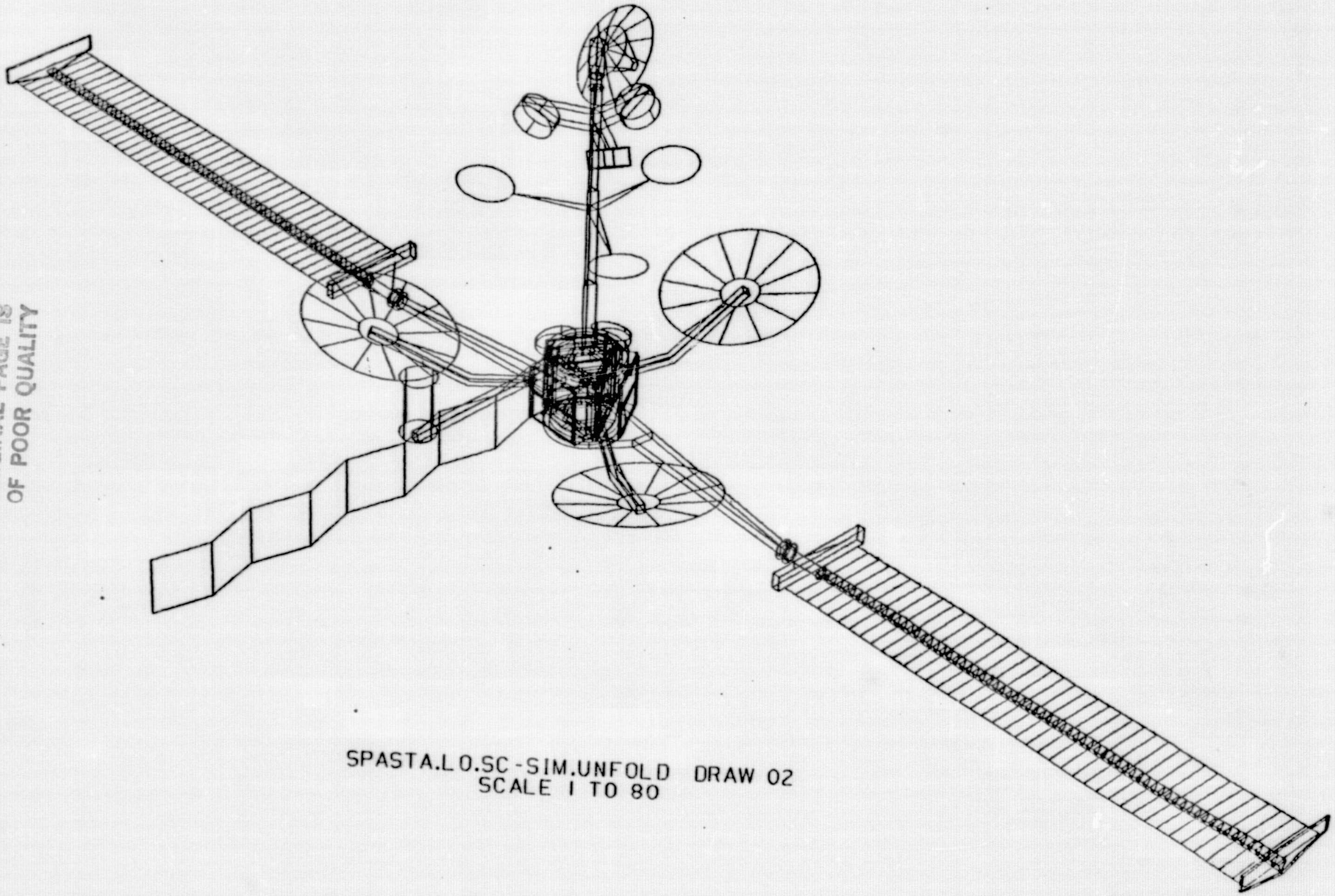
FUNCTIONAL FLOW SATELLITE ASSEMBLY TECHNICAL DEMONSTRATION

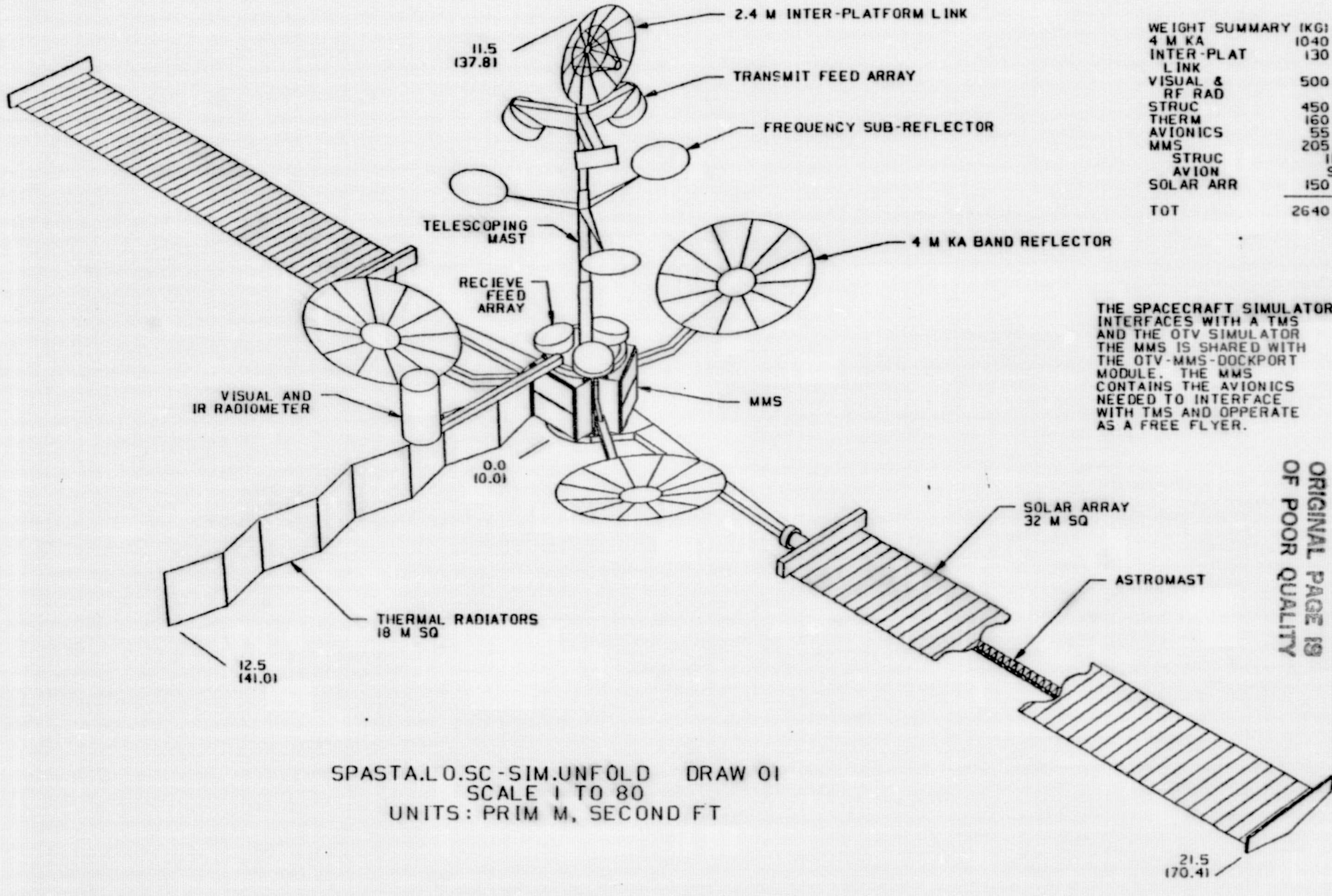




SPASTA.LO.SC-SIM.FOLD DRAW 01
SCALE 1 TO 80
UNITS: PRIM M, SECOND FT



SPASTA.LO.SC-SIM.UNFOLD DRAW 02
SCALE 1 TO 80



WEIGHT SUMMARY (KG)		
4 M KA	1040	
INTER-PLAT LINK	130	
VISUAL & RF RAD	500	
STRUC	450	
THERM	160	
AVIONICS	55	
MMS	205	
STRUC		115
AVION		90
SOLAR ARR	150	
TOT	2640	

THE SPACECRAFT SIMULATOR INTERFACES WITH A TMS AND THE OTV SIMULATOR THE MMS IS SHARED WITH THE OTV-MMS-DOCKPORT MODULE. THE MMS CONTAINS THE AVIONICS NEEDED TO INTERFACE WITH TMS AND OPPERATE AS A FREE FLYER.

SPASTA.LO.SC-SIM.UNFOLD DRAW 01
SCALE 1 TO 80
UNITS: PRIM M, SECOND FT

PAYLOAD ELEMENT NAME
ON-BOARD SAT SERV TECH DEM (SS-4

CODE
BACK2072

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name KEITH MILLER
Address BOEING AEROSPACE CO

Telephone 206/773-8150

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1994 Number of Flights 1 Duration of Flight, Days 30

OBJECTIVE
SATELLITE SERVICING TECHNOLOGY DEMONSTRATIONS: DEMONSTRATE CAPABILITY TO RETRIEVE SATELLITE AND BRING TO SPACE STATION; MAINTENANCE/UPGRADE OF S/C; ORU REPLACEMENT.

DESCRIPTION
USE THE TMS FREE-FLYER SIMULATOR FROM SS-2 (BACK2070) AS THE TEST ARTICLE FOR THIS ON-BOARD SATELLITE SERVICING TECHNOLOGY DEMO. FLY THE TMS BACK TO THE SPACE STATION IN BOTH THE SELF-PROPELLED MODE AND ALSO RETRIEVE IT WITH ANOTHER TMS. BRING THE TEST ARTICLE ON-BOARD THE SPACE STATION. CHANGEOUT BATTERIES, REPLENISH PROPELLANTS, AND PERFORM OTHER SERVICING TASKS. RETURN THE TEST ARTICLE TO ITS ORBITAL LOCATION.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): Frequency (MHz):

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day

Film (Amount): Voice (Hours/Day):

Live TV (Hours/Day): Other:

On-Board Storage (Mbit):

Data Dump Frequency (Per Orbit) Downlink command rate:

Recording Rate (KBPS) Downlink Frequency (MHz):

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THERMAL

( ) Active ( ) Passive

Temperature, deg C Operational Minimum Maximum

Non-operational Minimum Maximum

Heat Rejection, W Operational Minimum Maximum

Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal (X) External ( ) Remote

Equipment ID/Function ( ) Pressurized (X) Unpressurized

Length: 2.00 meters Width: 1.00 meters Height: 1.00 meters (Stowed)

Length: 2.00 meters Width: 1.00 meters Height: 1.00 meters (Deployed)

Launch mass, kg: 500 Return mass, kg: 500

Consumable Types

Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS

Crew Size Task Assignments

Skills (See Table B)

Skill	7	8	9	10	11	12	13	15		
Level	3	3	3	3	3	3	3	3		
Hours/Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

EVA (X) Yes ( ) No Reason MAINTENANCE Hours/EVA

SERVICING/MAINTENANCE

Service: Interval days Consumables kg

Returnables kg Man hours required

Configuration Changes: Interval days Man-Hours Required

Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

THIS TEST ARTICLE'S DELIVERY IS ACCOUNTED FOR IN SS-2 (BACM2070).

THE REPLACEMENT PARTS ARE WHAT ARE ACCOUNTED FOR HEREIN.

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times	
OTV Up/Down	0 days
OTV or TMS on Orbit	1 days
Mission Use	2 days/year
IVA Service	2 man-days/year
EVA Service	2 man-days/year
Experiment Ops	2 man-days/year
Service Frequency	1 times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	2.90 meters	Width:	4.35 meters	Height:	2.60 meters	(Stowed)
Length:	2.90 meters	Width:	4.35 meters	Height:	2.60 meters	(Deployed)

Mass: 1000 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

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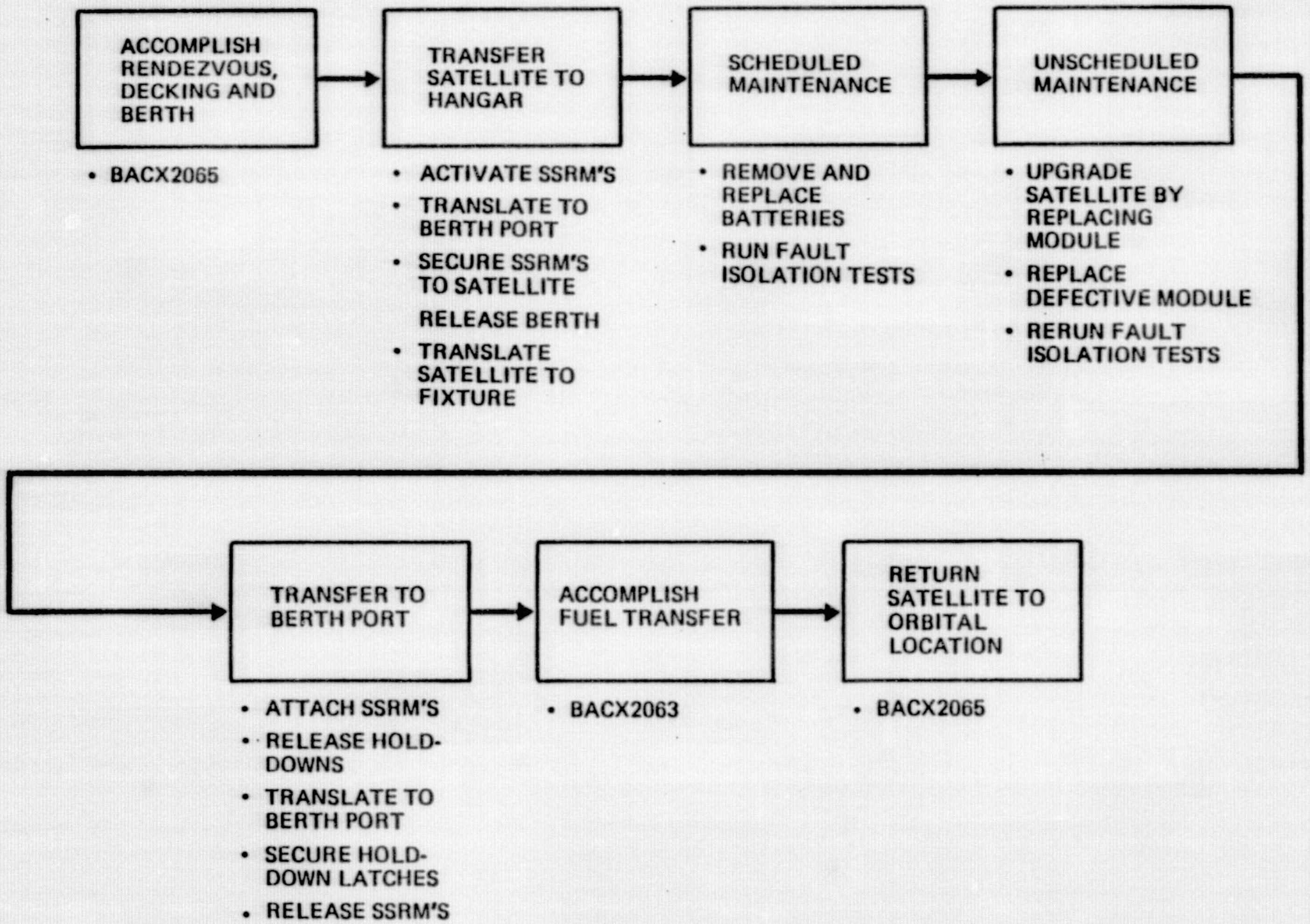
FUNCTIONAL FLOW ON-BOARD SAT SERV TECHNICAL DEMONSTRATION



PAYLOAD ELEMENT NAME
INSITU SAT UNMANNED SERV (SS-5)

CODE
BACK2073

CONTACT
Name KEITH MILLER
Address BOEING AEROSPACE

Telephone 206/733-8150

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1997 Number of Flights 1 Duration of Flight, Days 14

OBJECTIVE
SATELLITE SERVICING TECHNOLOGY DEMONSTRATION: DEMONSTRATE CAPABILITY TO REPAIR/SERVICE FREE-FLYING S/C BY REMOTE CONTROL RESUPPLY AND HARVESTING OF PRODUCTS FROM FACTORY SATELLITE.

DESCRIPTION
USE THE SATELLITE ASSEMBLY TEST ARTICLE FROM THE SS-3 TECH DEMO MISSION. THIS TEST ARTICLE WOULD BE DEPLOYED TO A STATION-KEEPING LOCATION USING A TMS. ANOTHER TMS OUTFITTED WITH A SERVICING MODULE WOULD FLY OVER TO THE TEST ARTICLE AND PERFORM IN-SITU SERVICING. THIS WOULD INCLUDE RENDEZVOUS & DOCKING, SATELLITE SYSTEM DEACTIVATION, COMPONENT REMOVE/REPLACE, PROPELLANT RESUPPLY, MATERIALS RESUPPLY/PRODUCT HARVESTING, REACTIVATION OF SUBSYSTEMS, AND DEMATING AND RETURN.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg ANY Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External (X) Remote
Equipment ID/Function ( ) Pressurized ( ) Unpressurized
Length: meters Width: meters Height: meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)
Launch mass, kg: Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill	7	8	9	10	11	15				
Level	3	3	3	3	3	3				
Hours/Day	0.00	0.00	0.00	0.00	0.00	0.00				

EVA (X) Yes ( ) No Reason PREPARE FOR TEST Hours/EVA 48

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions
DELIVERY OF REPLACEMENT COMPONENTS ACCOUNTED FOR IN SS-4 MISSION (BACM2072).

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Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer
- ( ) Not Serviced — F
- (X) Remote TMS — FT
- ( ) Remote Manned — FM
- ( ) Serviced at Station (TMS Retrieved) — FST
- ( ) Serviced at Station (Self-propelled) — FS

Platform Based
- ( ) Not Serviced — P
- ( ) Remote TMS — PT
- ( ) Remote Manned — PM
- ( ) Serviced at Station (TMS Retrieved) — PST
- ( ) Serviced at Station (Self-propelled) — PS

Other
- ( ) Space Station Based — SS
- ( ) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- (X) Medium
- ( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	2 days
Mission Use	14 days/year
IVA Service	4 man-days/year
EVA Service	8 man-days/year
Experiment Ops	2 man-days/year
Service Frequency	2 times/year

Delta Velocities
- Up
- Down
- Aero Return

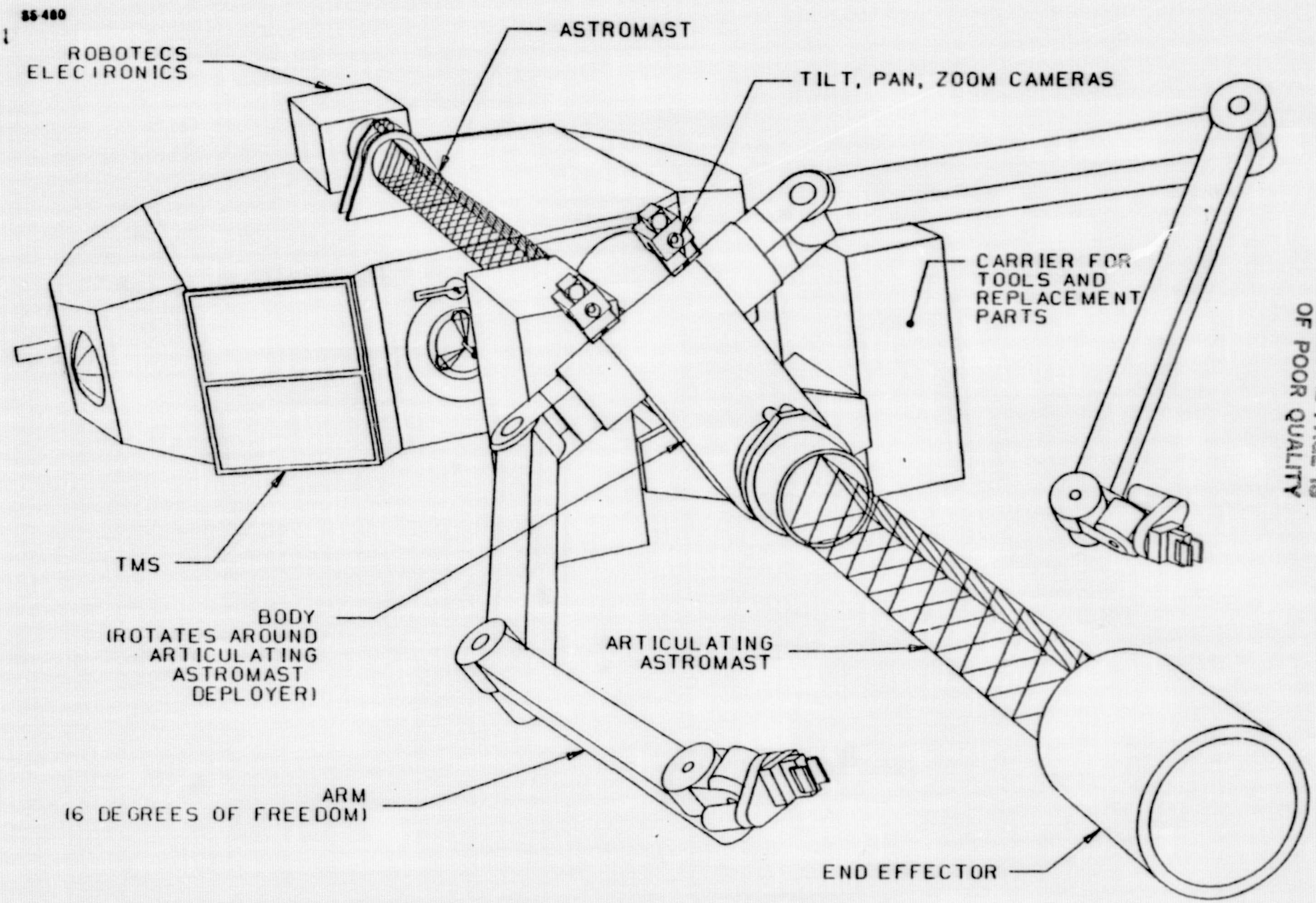
Support Equipment

Length: meters Width: meters Height: meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)

Mass: kg

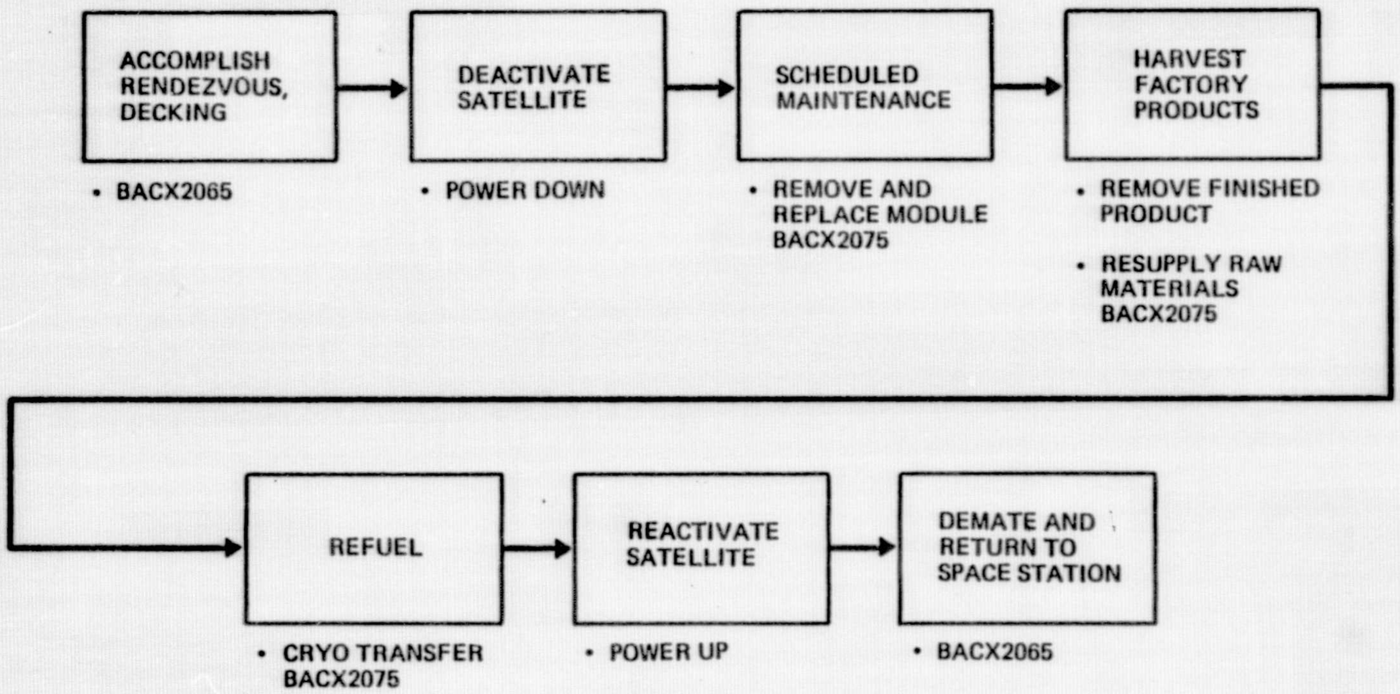
Manifest Restrictions
- ( ) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload



SPACECRAFT ROBOTIC SERVICER

FUNCTIONAL FLOW INSITU SAT UNMANNED SERV



PAYLOAD ELEMENT NAME
SURFACE INTERACTION W/RCS PLUME

CODE
BACH2074

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 13

CONTACT
Name DAVID S. PARKHAN
Address BOEING AEROSPACE CO

Telephone 206/773-2020

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 8

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 2001 Number of Flights 1 Duration of Flight, Days 90

OBJECTIVE
TO PROVIDE TECHNOLOGY BASE FOR DETERMINING THE CHARACTERISTICS OF REACTION CONTROL SYSTEM PLUME FLOW AND HEATING RATES ON AND AROUND SURFACES. OF PARTICULAR INTEREST IS HOW A PLUME WHICH IS IN A FREE MOLECULAR FLOW STATE OR TRANSITIONING TO FREE MOLECULAR FLOW REACTS TO STRUCTURAL EDGES. HEATING OF SECONDARY SURFACES WHICH ARE SHADOWED FROM DIRECT PLUME IMPINGEMENT IS ALSO OF INTEREST.

DESCRIPTION
VARIOUS STRUCTURAL SHAPES WILL BE PLACED WITHIN THE PLUME OF REACTION CONTROL SYSTEMS. THE SHAPES WILL BE INSTRUMENTED TO GATHER DATA ON PLUME HEATING DUE TO DIRECT PLUME IMPINGEMENT WHILE PROBES WILL GATHER DATA ON THE PLUME HEATING RATES AROUND THE SHAPE. THE STRUCTURAL SHAPES AND PROBES WILL HAVE TO BE REORIENTED RELATIVE TO THE REACTION CONTROL SYSTEM TO ALLOW INVESTIGATION OF DIFFERENT PLUME FLOW STATES. LOCATING THIS SYSTEM ON THE SPACE STATION WOULD PERMIT RECONFIGURING OF THE STRUCTURAL SHAPES, REPLACEMENT OF THE TEMPERATURE TRANSDUCER WHICH MAY FAIL DUE TO THE SEVERE THERMAL ENVIRONMENT, INSPECTION OF THE STRUCTURES FOR DEGRADATION DUE TO PLUME IMPINGEMENT, INVESTIGATION OF PLUME RELATED CONTAMINATION AND FLEXIBILITY TO SUPPORT A PARTICULAR SPACECRAFT'S QUAL TEST PROGRAM. PRIMARY PROPULSION SYSTEM WHICH WOULD BE INVESTIGATED WOULD BE THE SPACE STATION'S REACTION CONTROL SYSTEM.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes ( ) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Tolerance + -
Nodal Angle, deg
Escape dV Required, m/s Ephemeris Accuracy, m

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth ( ) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC
Power, W Duration, Hrs/Day
Operating
Standby
Peak ( ) Continuous
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount):
Live TV (Hours/Day): 1.00 Voice (Hours/Day):
On-Board Storage (Mbit): Other:
Data Dump Frequency (Per Orbit)
Recording Rate (KBPS) Downlink command rate:
Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

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EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: 1.00 meters Width: .50 meters Height: .50 meters (Stowed)
Length: 1.00 meters Width: 1.00 meters Height: .70 meters (Deployed)
Launch mass, kg: 100 Return mass, kg: 100
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size 2

Task Assignments

Skills (See Table B)

Skill	5	11									
Level	3	3									
Hours/Day	0.00	0.00									

EVA (X) Yes ( ) No Reason INSTALL EXP Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
(X) Low
( ) Medium
( ) High

Operations Times	
OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	90 days/year
IVA Service	4 man-days/year
EVA Service	10 man-days/year
Experiment Ops	20 man-days/year
Service Frequency	3 times/year

Delta Velocities
Up
Down
Zero Return

Support Equipment

Length: meters	Width: meters	Height: meters	(Stowed)
Length: meters	Width: meters	Height: meters	(Deployed)

Mass: kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab 0
Number of Appendages 2
Number of Modules Required to Assemble the Payload 1

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SURFACE INTERACTION W/RCS PLUME 2074

EVA

Safe RCS thruster

Activate lighting

Activate remote TV

Checkout work area WRTV

Gather tools

Activate Rms

Translate to plume module

Service Rms to plume module

Translate plume module to RCS thruster

Alighn structural shapes at thruster

Secure structural shapes

Release RMS and stow

Hook up wiring

Test wiring for continuity

Clear thruster area

Unlock RCS thruster

Test thruster & shape sensors

Stow tools

Deactivate TV

Deactivate lights

End EVA

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I/ SPACE12 PCMOUT

START 5

REVISION NINE (15 FEBRUARY 1982)

TALE SURFACE INTERACTION W/RCS PLUME
WWRAP 60 75 130 50 120 60 30 15
REMOTE 0 0
NSUPPORT 1 .3 1 .3
ISUPPORT .5 .2 1 1 1
WEIGHT 0 0 100 100
SCHEDULE 0 0
FINAL 1 0
FLIGHT 0 0
TOOLING 1
SPARES 10
SETS 1
CLASS 0
DEV

*** PCM MODEL REVISION NINE 24 FEB 1983 ***

ENGINEERING ****** ENGINEERING ******** ENGINEERING ****** ENGINEERING

	BOEING DESIGN HOURS	BOEING DEV SHOP HOURS	BOEING DES & SHOP DOLLARS	SUB/GFE TOTAL DOLLARS
S1 STRUCTURE				
M7 ALUM STRUCTURE 90 2 1 0 100	190.	57.	16508.	
M5 FASTENERS 10 2 1 0 100	20.	6.	1733.	
MIT INTEG & TEST 0 3 0 0	23.	7.	2035.	

END
MFG

*** PCM MODEL REVISION NINE 24 FEB 1983 ***

MANUFACTURING **** MANUFACTURING **** MANUFACTURING **** MANUFACTURING

	BOEING B.F.L. HOURS	BOEING Q.C. HOURS	BOEING MANUFACTUR DOLLARS	SUB/GFE TOTAL DOLLARS
S1 STRUCTURE				
M7 ALUM STRUCTURE 90 2 3 0 100	2068.	403.	367300.	
M5 FASTENERS 10 2 3 0 100	242.	36.	33300.	
MAC ASSY & C/O 0 3 0 0	152.	22.	20869.	

END

*** PCM MODEL REVISION NINE 24 FEB 1983 ***

*** BOEING*BOEING ** PCM HOURS SUMMARY HOURS PCM ** BOEING*BOEING ****

TITLE: SURFACE INTERACTION W/RCS PLUME

BOEING HARDWARE SUBSYSTEM HOURS

	DESIGN	DEV SHOP	B.F.L.	Q.C.
S1 STRUCTURE	232	70	2080	462
BOEING SUBTOTAL	232	70	2080	462

HARDWARE ASSEMBLY & C.O 231

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	120.1
SOFTWARE ENGINEERING	200
SYSTEMS GROUND TEST CONDUCT	391
SYSTEMS FLIGHT TEST CONDUCT	

BOEING SUBTOTAL	232	70	3060	462

HARDWARE ASSEMBLY & C/O 531

BOEING SUPPORT HOURS

SYSTEM ENGINEERING & INTEGRATION	1203
SOFTWARE ENGINEERING	303
SYSTEMS GROUND TEST CONDUCT	391
SYSTEMS FLIGHT TEST CONDUCT	0
SUPPORT EQUIPMENT DESIGN	89
SUPPORT EQUIPMENT MFG	113
TOOLING & SPECIAL TEST EQUIPMENT	732
SPARES	354
LIAISON ENGINEERING	325
DATA	317
PROGRAM MANAGEMENT (ENG)	448
PROGRAM MANAGEMENT (MFG)	944

BOEING HOURS SUMMARY RECAP

BOEING DESIGN & DEV SHOP HOURS	300
BOEING HARDWARE BFL & QC HOURS	4100
BOEING SUPPORT HOURS	3200
BOEING PROGRAM HOURS (NOMINAL SCHEDULE)	7600

*** PCM MODEL REVISION NINE 24 FEB 1983 ***

DOLLARS SUMMARY IN MILLIONS

TITLE: SURFACE INTERACTION W/RCS PLUME

	--DEVELOPMENTAL-- ENGR.	HARDWARE
HARDWARE SUBSYSTEM COST ($M)		
B1 STRUCTURE	0.021	0.423
SUBSYSTEM HARDWARE SUBTOTAL ($M)	0.021	0.423
GFE/SUBCON/GIVEN COST ($M)		
	0.0	0.0
SUBCON/GIVEN (B1-B50) SUBTOTAL ($M)	0.0	0.0
HARDWARE ASSEMBLY & C/O		0.064
HARDWARE SUBTOTAL ($M)		0.487
SUPPORT COST ($M)		
SYSTEM ENGINEERING & INTEGRATION	0.072	
SOFTWARE ENGINEERING	0.022	
SYSTEMS GROUND TEST CONDUCT	0.030	
SYSTEMS FLIGHT TEST CONDUCT	0.0	
PECULIAR SUPPORT EQUIPMENT	0.006	0.012
TOOLING & SPECIAL TEST EQUIPMENT		0.038
SPARES		0.042
LIAISON ENGINEERING	0.019	
DATA	0.014	
PROGRAM MANAGEMENT	0.032	0.107
SUPPORT EFFORT SUBTOTAL ($M)	0.204	0.199
TOTAL ($M) (NOMINAL SCHEDULE)	0.224	0.686

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PAYLOAD ELEMENT NAME
ROBOTICS

CODE
BACX2075

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name H.B. LIEMOHN
Address BOEING AEROSPACE

Telephone 206/773-1764

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 7

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1997 Number of Flights 1 Duration of Flight, Days 180

OBJECTIVE
ROBOTICS TECHNOLOGY DEMONSTRATION: SITUATION MONITORING, ARTIFICIAL INTELLIGENCE, SOFTWARE DEVELOPMENT, MOBILITY CONTROL, END-EFFECTORS, PROPULSION SYSTEMS, AND STRUCTURES AND MATERIALS.

DESCRIPTION
DEVELOP ROBOTS, TO ACCOMPLISH ASSEMBLY AND MAINTENANCE TASKS. UTILIZE THESE ROBOTS TO ACCOMPLISH SPECIFIC TASKS AND DEMONSTRATE THE CAPABILITIES LISTED IN THE OBJECTIVE.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes ( ) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth ( ) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	3000	
Standby		( ) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): 8.00 Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
Length: 1.78 meters Width: 1.27 meters Height: 1.1 meters (Stowed)
Length: 7.90 meters Width: 1.27 meters Height: 1.1 meters (Deployed)
Launch mass, kg: 3629 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size 5 Task Assignments

Skills (See Table B)

Skill	5	8	9	12	13					
Level	3	2	2	3	3					
Hours/Day	8.00	4.00	4.00	8.00	8.00					

EVA (X) Yes ( ) No Reason SETUP & ADJUSTMENT Hours/EVA 540

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	0 days
OTV or TMS on Orbit	0 days
Mission Use	180 days/year
IVA Service	20 man-days/year
EVA Service	90 man-days/year
Experiment Ops	90 man-days/year
Service Frequency	10 times/year

Delta Velocities
Up
Down
Aero Return

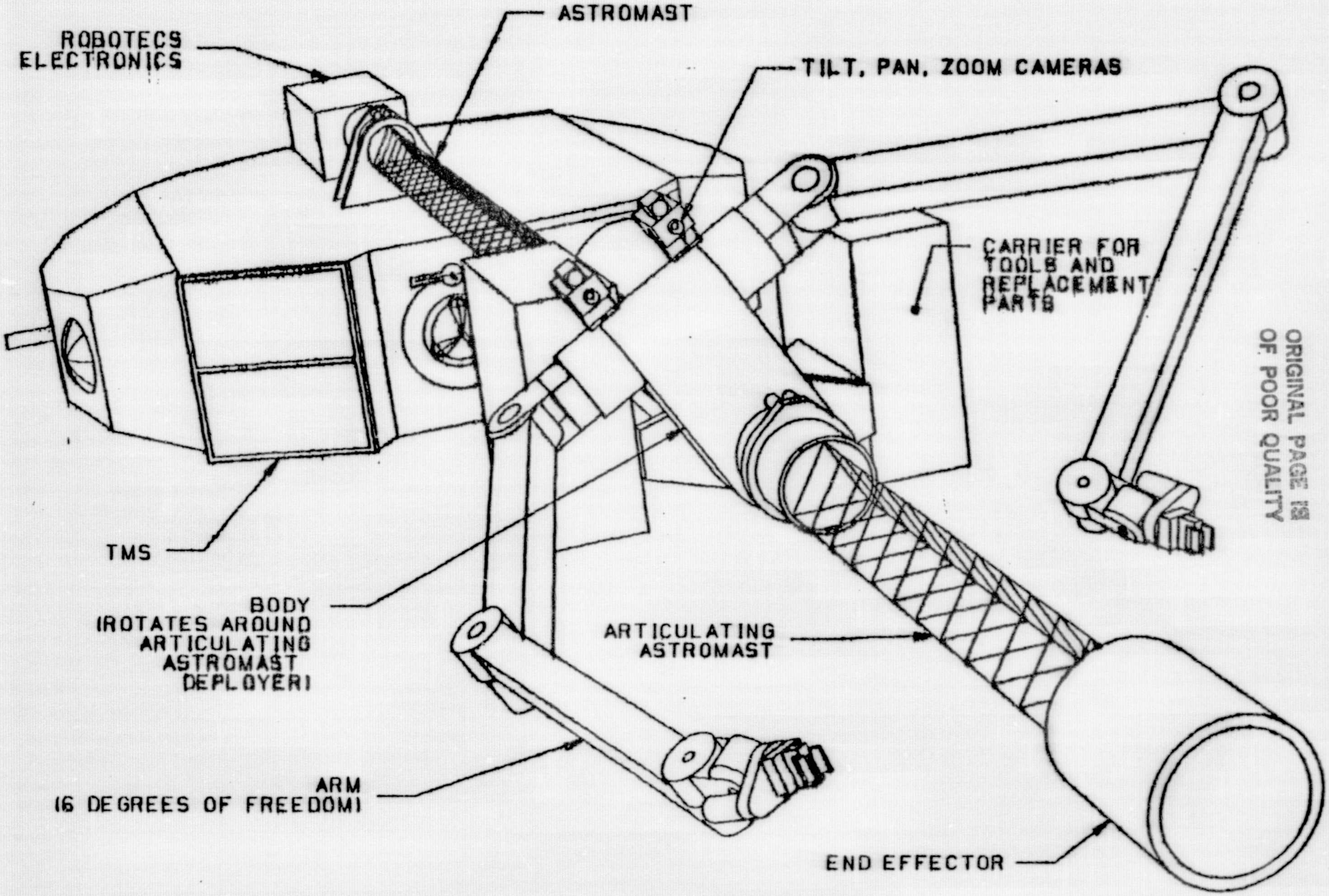
Support Equipment

Length: meters	Width: meters	Height: meters	(Stowed)
Length: meters	Width: meters	Height: meters	(Deployed)

Mass: kg

Manifest Restrictions
( ) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages 1
Number of Modules Required to Assemble the Payload 2



SPACECRAFT ROBOTIC SERVICER

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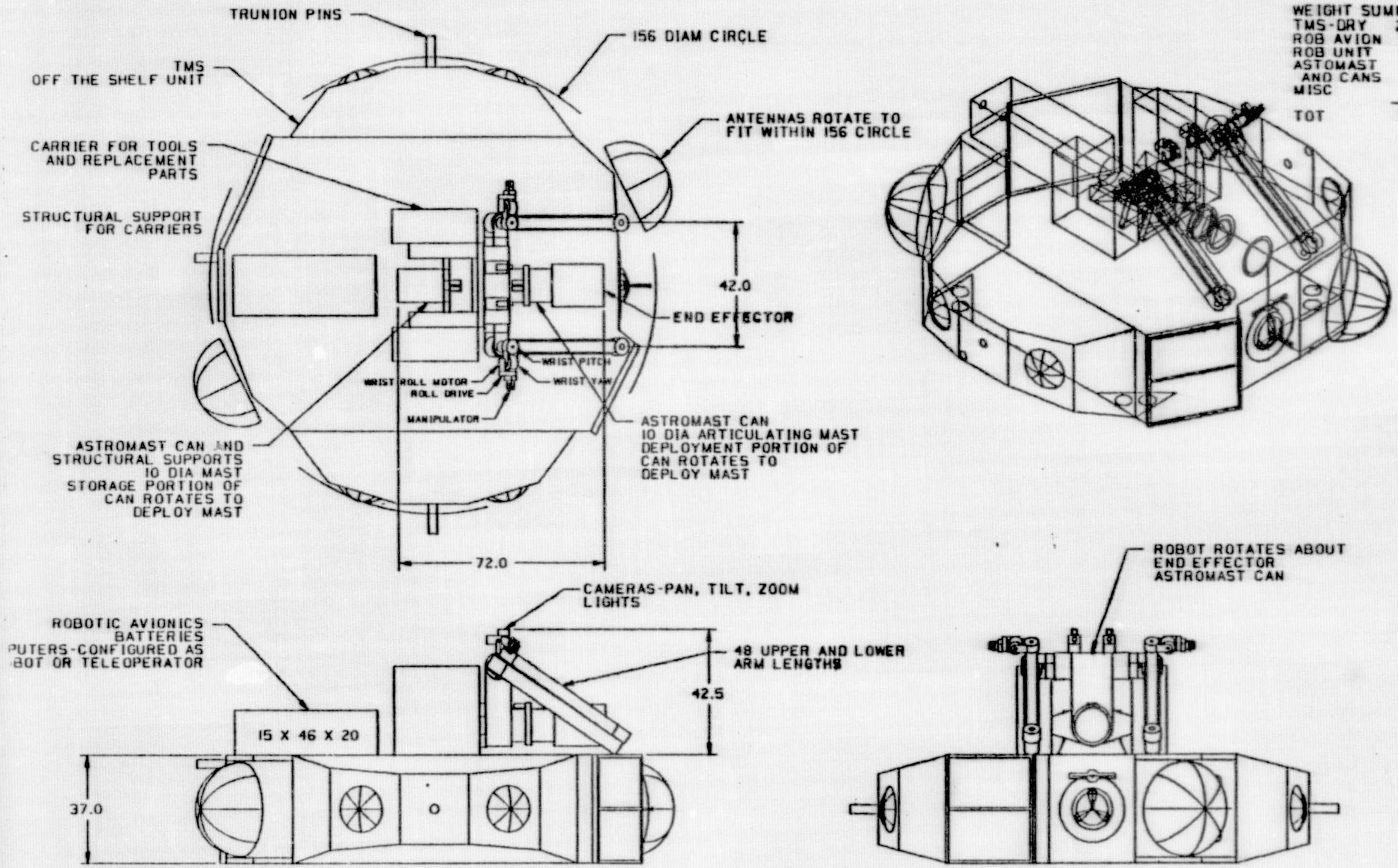
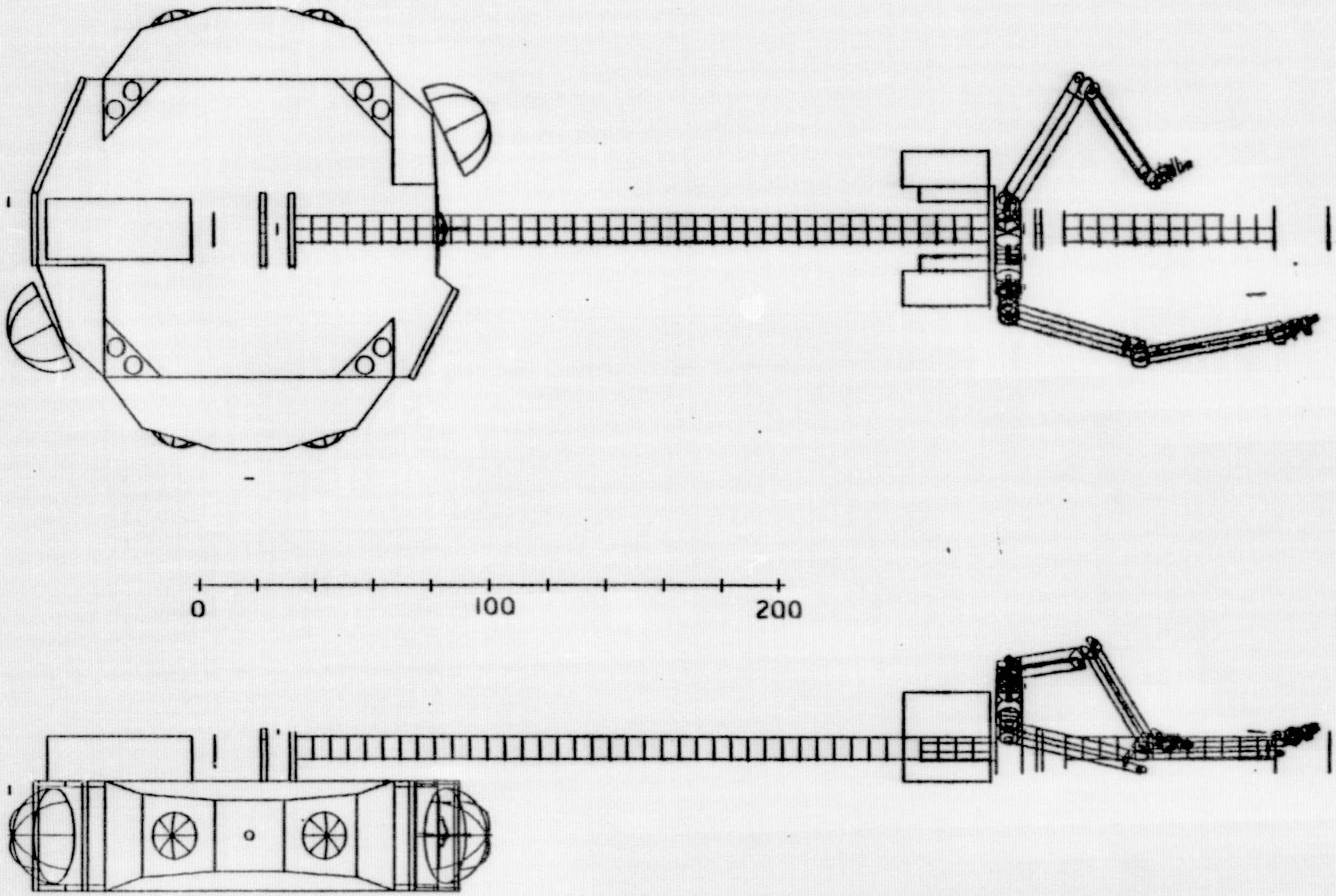
WEIGHT SUMMERY	
TMS-DRY	2500
ROB AVION	300
ROB UNIT	200
ASTOMAST AND CANS	80
MISC	100
TOT	3180



SPASTA.LO.SC-SERVICER.FOLD DRAW 01
SCALE FULL PICTURE SCALE 1 TO 30
UNITS IN



SPASTA.LO.SC-SERVICER.UNFOLD DRAW LAYOUT
SCALE .03

- - - PRICE 84 - - -
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:47 FILENAME: REID.DAT
(283010)

ROBOTICS

		UNIT WEIGHT	900.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	100.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	3440.	-	3440.
DESIGN	12990.	-	12990.
SYSTEMS	3707.	-	3707.
PROJECT MGMT	5949.	-	5949.
DATA	674.	-	674.
SUBTOTAL(ENG)	26760.	-	26760.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	13315.	-	13315.
TOOL-TEST EQ	9820.	-	9820.
SUBTOTAL(MFG)	23135.	-	23135.
TOTAL COST	49896.	-	49896.

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PAYLOAD ELEMENT NAME
EARTH OBSERVATION INST DEV MAPS

CODE
BACX2000

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 12

CONTACT
Name H.G. REICHLE, JR
Address LANGLEY RESERACH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 3

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: Number of Flights Duration of Flight, Days

OBJECTIVE
TO PROVIDE TECHNOLOGY BASE FOR THE DEVELOPMENT OF PASSIVE REMOTE SENSOR OF ATMOSHPERIC TRACE GASES.

DESCRIPTION
MODULAR INSTRUMENTS WHICH WOULD ALLOW CHANGING OF COMPONENTS WOULD BE FLOWN. VARIOUS TESTS TO DETERMINE SUCH THINGS AS OPTIMUM BANDPASSES, FILTERING, AND SCANNING COULD BE PERFORMED FOR DIFFERENT INSTRUMENT CONCEPTS AND TARGET GASES.

SEE SCIENCE & APPLICATIONS MISSIONS BACX0004

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg . Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar (X) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec . Field of View (deg) .
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
(X) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	200	
Standby		( ) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
(X) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz): .
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day .
Film (Amount): Voice (Hours/Day): .
Live TV (Hours/Day): . Other:
On-Board Storage (Mbit): .
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) . Downlink Frequency (MHz): .

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: W, m: H, m: Stowed
L, m: W, m: H, m: Deployed
Launch mass, kg: Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

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MISSION TYPE — OPS CODE

Free Flyer
- ( ) Not Serviced — F
- ( ) Remote TMS — FT
- ( ) Remote Manned — FM
- ( ) Serviced at Station (TMS Retrieved) — FST
- ( ) Serviced at Station (Self-propelled) — FS

Platform Based
- ( ) Not Serviced — P
- ( ) Remote TMS — PT
- ( ) Remote Manned — PM
- ( ) Serviced at Station (TMS Retrieved) — PST
- ( ) Serviced at Station (Self-propelled) — PS

Other
- ( ) Space Station Based — SS
- ( ) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities
- Up
- Down
- Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

PAYLOAD ELEMENT NAME
EARTH OBSERVATION INSTR DEVELOP

CODE
BACX2002

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 12

CONTACT
Name R.V. HESS
Address LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 3

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE THE TECHNOLOGY FOR HIGH PULSE ENERGY AND HIGH REPETITION CO2 LASERS WITH HIGH FREQUENCY STABILITY AND WIDE TUNING RANGE AND LONG LASER LIFE TIMES.

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DESCRIPTION
THE MISSION WILL PROVIDE THE TECHNOLOGY FOR THE MISSION OBJECTIVES. KEY ISSUES ARE ESTABLISHED OF THE LASER CHARACTERISTICS IN THE SPACE STATION ENVIRONMENT WITH BENEFITS FROM THE MANNED TECHNOLOGY LABORATORY.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	25	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous
Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None   ( ) Realtime   ( ) Offline   ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0   Frequency (MHz): 0.00
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital   Hours/Day 0.00
Film (Amount): 0   Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00   Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0   Downlink command rate: 0
Recording Rate (KBPS) 0.00   Downlink Frequency (MHz): 0.00

THERMAL
(X) Active   ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal   ( ) External   ( ) Remote
Equipment ID/Function   (X) Pressurized   ( ) Unpressurized
L, m: 0.00   W, m: 0.00   H, m: 0.00   Stowed
L, m: 0.00   W, m: 0.00   H, m: 0.00   Deployed
Launch mass, kg: 0   Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g)   min: 0.00E+00   max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0   Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No   Reason   Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0   Consumables, kg 0
Returnables, kg 0   Man hours 0.00
Configuration Changes: Interval, day 0   Man/Hours Required 0.00
Deliverables, kg 0   Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

( ) Space Station Based	SS
( ) Sortie	SOR

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CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

C-3

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

PAYLOAD ELEMENT NAME
SATELLITE DOPPLER METEOR RADAR T

CODE
BACX2003

CONTACT
Name L.D. STATON
Address LANGLEY RESEARCH CENTER
3631

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 12

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 5

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate ( ) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
DEVELOP ENABLING TECHNOLOGY REQUIRED FOR PUSHBROOM DOPPLER RADAR MEASUREMENT OF GLOBAL RAINFALL RATES AND OCEAN SURFACE WIND VECTOR ASSOCIATED WITH STORM SYSTEMS AND OTHER SPECIAL METEORLOGICAL FEATURES. DEVELOPMENT TECHNIQUES USING MILLIMETER WAVES WILL ALSO BE EVALUATED TO PROVIDE THREE DIMENSIONAL DEFINITION OF NON PRECIPITATING CLOUDS.

DESCRIPTION
A MULTIFREQUENCY SPACEBORNE METEOROLOGICAL RADAR WILL BE ASSEMBLED FOR IN-ORBIT OPERATIONS IN A MODULARIZED FORM SO THAT DIFFERENT AND/OR ADDITIONAL RECEIVER CHANNELS AND ANTENNA BEAMS CAN BE IMPLEMENTED AS THE EXPERIMENT MATURES TOWARDS A PROOF-OF-CONCEPT DESIGN FOR POTENTIAL OPERATIONAL USE.

SEE SCIENCE & APPLICATIONS MISSION BACX0003

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 60.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 100
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar (X) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.08 Field of View (deg) 40.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	3000	1.00
Standby	300	0.00
Peak	3000	0.00

(X) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum -10 Maximum 55
Non-operational Minimum 0 Maximum 0
Heat Rejection, w Operational Minimum 200 Maximum 200
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed
L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed
Launch mass, kg: 0 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA (X) Yes ( ) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stowed)
Length:	0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

PAYLOAD ELEMENT NAME
MICROWAVE REMOTE SENS TECH

CODE
BACX2004

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 12

CONTACT
Name R.F. HARRINGTON
Address LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 5

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
DEMONSTRATION OF SMART SENSOR TECHNOLOGY FOR PASSIVE MICROWAVE REMOTE MEASUREMENTS WITH REAL TIME TARGET ADAPTABLE SENSOR MODE OPTIMIZATION SUCH AS RESOLUTION CELL SIZE AND MEASUREMENT ACCURACY.

DESCRIPTION
A MULTIPLE FREQUENCY, MULTIPLE BEAM IMAGING MICROWAVE RADIOMETER SYSTEM WOULD BE DEVELOPED AND EVALUATED IN SPACE TO MEASURE SEVERAL GEOPHYSICAL PARAMETERS SIMULTANEOUS. THESE PARAMETERS ARE SOIL MOISTURE, SEA SURFACE TEMPERATURE, OCEAN SURFACE WIND SPEED, RAIN RATE, SEA ICE CLASSIFICATION DATA, ATMOSPHERIC DATA, ETC

SEE SCIENCE & APPLICATIONS MISSIONS BACX0022 & 0023.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 250.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar (X) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.10 Field of View (deg) 30.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	200	0.00	
Standby	30	0.00	(X) Continuous
Peak	300	0.00	
Voltage, V	78	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime (X) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 100.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed
L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed
Launch mass, kg: 0 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

PAYLOAD ELEMENT NAME
EARTH FEATURE IDENTIFICATION

CODE
BACX2005

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 12

CONTACT
Name R. HILL
Address JOHNSON SPACE CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 8

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO USE A MANNED EARTH OBSERVATORY TO LOCATE AND STUDY TRANSIENT PHENOMENA AND TO SUPPORT REMOTE SENSING RESEARCH WITH THE GOAL OF DEFINING ANALYSIS TECHNIQUES AND SYSTEMS FOR USE IN REMOTE SENSING APPLICATIONS.

DESCRIPTION
BASIC RESEARCH AND SCIENTIFIC STUDIES - MAN COULD PLAY AN IMPORTANT ROLE IN ORIENTING INSTRUMENTS TO OBSERVE AND RECORD PHENOMENA THAT ARE TRANSITORY IN EITHER TIME OR LOCATION. BY USING REAL-TIME DISPLAYS HE COULD PLAY AN IMPORTANT ROLE IN SELECTING THE BEST INSTRUMENTATION TO RECORD WHAT HE WAS OBSERVING. MAN COULD SELECTIVELY TRANSMIT APPROPRIATE DATA TO THE GROUND FOR CONSULTATION WITH GROUND BASED EXPERTS. AN ONBOARD OBSERVER COULD ALSO PLAY AN IMPORTANT ROLE IN FINE TUNING THE POINTING ANGLES AND IMAGE MOTION COMPENSATION TO ACQUIRE DATA FROM GROUND SITES OF KNOWN LOCATION. THIS WOULD BE PARTICULARLY IMPORTANT WHERE INSTRUMENTS WITH NARROW FIELDS OF VIEW OR HIGH SPATIAL RESOLUTION WERE INVOLVED.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00
Voltage, V	0	Frequency, Hz 0

( ) Continuous

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None   ( ) Realtime   ( ) Offline   ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0   Frequency (MHz): 0.00
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital   Hours/Day 0.00
Film (Amount): 0   Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00   Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0   Downlink command rate: 0
Recording Rate (KBPS) 0.00   Downlink Frequency (MHz): 0.00

THERMAL
(X) Active   ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal   ( ) External   ( ) Remote
Equipment ID/Function   (X) Pressurized   ( ) Unpressurized
L, m: 0.00   W, m: 0.00   H, m: 0.00   Stowed
L, m: 0.00   W, m: 0.00   H, m: 0.00   Deployed
Launch mass, kg: 0   Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g)   min: 0.00E+00   max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0   Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No   Reason   Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0   Consumables, kg 0
    Returnables, kg 0   Man hours 0.00
Configuration Changes: Interval, day 0   Man/Hours Required 0.00
    Deliverables, kg 0   Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions
CLEAN OUTSIDE ENVIRONMENT

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

PAYLOAD ELEMENT NAME
EARTHBOUND ORIENTED INST DEV

CODE
BACX2007

CONTACT
Name W.E. HOWELL
Address LANGLEY RESEARCH CENTER

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 12

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 5

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO DEVELOP INSTRUMENTATION WHICH SENSES VARIOUS EARTH-BOUND PHENOMENA.

DESCRIPTION
PRESENT SPACE INSTRUMENTATION WHICH IS INTENDED TO SENSE EARTH-BASED PHENOMENA IS RESTRICTED TO HIGHLY SELECTED BANDS IN THE ELECTROMAGNETIC SPECTRUM (E.G. THE VISIBLE AND RELATIVELY NARROW RF REGIONS). AS OUR SPECULATION AND UNDERSTANDING OF VARIOUS PHYSICAL PROCESSES INCREASE, WE WILL NEED TO DEVELOP SENSORS WITH AN INCREASINGLY WIDE VARIETY OF ATTRIBUTES. THESE SENSORS WILL, OF COURSE, BE INITIALLY BUILT AND LIMITED TESTING PERFORMED ON THE EARTH; HOWEVER, FULL OPERATIONAL POTENTIAL CAN BE BEST OBTAINED IF DEVELOPMENTAL TESTING IS DONE FROM THE SPACE STATION.

SEE SCIENCE & APPLICATIONS MISSION BACX0049.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

(X) On-Board Data Processing Required

Description:

Data Types: (X) Analog (X) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed

L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed

Launch mass, kg: 0 Return mass, kg: 0

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval, days 0 Consumables, kg 0

Returnables, kg 0 Man hours 0.00

Configuration Changes: Interval, day 0 Man/Hours Required 0.00

Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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PAYLOAD ELEMENT NAME
LARGE SOLAR COLL

CODE
BACX2008

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name E.J. CONWAY
Address NASA-LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 10

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 1995 Number of Flights Duration of Flight, Days

OBJECTIVE
TO DEVELOP AND DEPLOY A LARGE PERMANENT MIRROR FACILITY TO CAPTURE AND CONCENTRATE AM-0 SOLAR RADIATION. TO ACCURATELY ESTABLISH THE OPTICAL CHARACTERISTICS OF THIS FACILITY THROUGH SYSTEMATIC MEASUREMENTS, AND TO ASSESS THE LONG-TERM STABILITY OF THE OPTICAL CHARACTERISTICS OF THE MIRROR.

DESCRIPTION
THE MISSION WILL PROVIDE THE FACILITY NECESSARY FOR OTHER ADVANCED ENERGETICS MISSIONS. IT WILL REQUIRE DEVELOPMENT AND DEPLOYMENT OF A LARGE STABLE CONCENTRATING REFLECTOR, AND WILL PERMIT ASSESSMENT OF THE STABILITY OF 1) REFLECTING OPTICAL COATINGS, AND 2) MECHANISMS FOR PRODUCING AND HOLDING OPTICAL QUALITY REFLECTOR SHAPES IN THE SPACE ENVIRONMENT.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial (X) Solar ( ) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	500	12
Standby		
Peak		

( ) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime (X) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
L, m: 5 W, m: 3 H, m: 3 Stowed
L, m: 12 W, m: 12 H, m: 10 Deployed
Launch mass, kg: 1296 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size

Task Assignments

Skills (See Table B)

Skill	11	12	13	9			
Level	3	3	3	3			
Hours/Day							

EVA (X) Yes ( ) No Reason CONSTRUCTION Hours/EVA

SERVICING/MAINTENANCE
Service: Interval, days 90 Consumables, kg 100
Returnables, kg Man hours 8.00
Configuration Changes: Interval, day
Deliverables, kg

SPECIAL CONSIDERATIONS/See Instructions
A SIGNIFICANT EFFORT WILL BE REQUIRED TO DEPLOY A LARGE HIGH-QUALITY REFLECTOR. MORE EFFORT WILL BE NEEDED TO CHARACTERIZE ITS OPERATION. THUS, IT REQUIRES MAN IN THE SET-UP LOOP. LATER IT WILL REQUIRE MAN TO INSTALL, CHECKOUT, OPERATE, AND REPAIR ADVANCED EXPERIMENTS. THIS FACILITY REQUIRES A MANNED SPACECRAFT WITH A MISSION LIFE THAT IS VERY LONG COMPARED TO THE SET-UP AND MAPPING TIME FOR THE MIRROR.
CONSIDER COMBINING THIS MISSION WITH BACX2012 (ION THRUSTER EFFECTS ON POWER SYSTEMS)
TO CREATE A POWER SYSTEMS RESEARCH PLATFORM. ALSO INCLUDE BACX2023 (SOLAR SUSTAINED PLASMA).

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
(X) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
(X) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)
Mass:	kg					

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 20

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- - - PRICE 84
ELECTRONIC ITEM

DATE 7-MAR-83 TIME 12:[illegible] (283010) FILENAME: REID2.DAT

LARGE SOLAR COLLECTOR

		UNIT WEIGHT	[illegible].00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	86.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	2796.	-	2796.
DESIGN	9103.	-	9103.
SYSTEMS	1665.	-	1665.
PROJECT MGMT	7365.	-	7365.
DATA	764.	-	764.
SUBTOTAL(ENG)	21692.	-	21692.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	23968.	-	23968.
TOOL-TEST EQ	12879.	-	12879.
SUBTOTAL(MFG)	36847.	-	36847.
TOTAL COST	58539.	-	58539.

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- - -PRICE 84- -
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UNIT WIGHT 286.00
3.00 UNI VOLUME 36.00

	EVELOPMEN	PODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	2796	-	2796.
DESIGN	9103.	-	9103.
SYSTEMS	1665.	-	1665.
PROJECT MGMT	7365.	-	7365.
DATA	764.	-	764.
SUBTOTAL(ENG)	21692.	-	21692.
MANUFACTURING			
PROTOTYPE	PRODUCTION	-	23968.
TOOL-TEST EQ	1289.	-	2379.
SUBTOTAL(MFG)	3687.	-	[illegible]
TOTAL COST	58539.	-	58539.

DESIGN FACTORS	ELECTRONIC	MECHANICAL	PRODUCT DESCRIPTORS	
WEIGHT	20.000	2860.00	ENGINEERING COMPLEXITY	0.800
DENSITY	43.70	33.26*	PROTOTYPE EFFORT	1.0
MFG COMPLEXITY	10.33	8400	PROTO SCHEDULE FACTOR	.20*
NEW DESIGN	0.400	0.50	ECCT VOL FRACTION	.005*

DESIGN REPEAT 0.000

2.000

EQUIPMENT CLASS	*****	*****	YEAR OF TECHNOLOGY	1987*
INTEGRATION LEVEL	0.0	0.0	RELIABILITY FACTOR	1.0
			MTBF(FIELD)	51135*

SCHEDULE	START		FIRST ITEM		FINISH	
DEVELOPMENT	JAN 87	(11)	NOV 87*	(9)	AUG 88*	(20)

SUPPLEMENTAL INFORMATION

YEAR OF ECONOMICS	1984	TOOLING & PROCESS FACTORS	
ESCALATION	0.00	DEVELOPMENT TOOLING	5.00
SPEC COST MULTIPLIER	1.14		

COST RANGES	DEVELOPMENT	PRODUCTION	TOTAL COST
FROM	50938.	-	50938.
CENTER	58539.	-	58539.
TO	66896.	-	66896.

PAYLOAD ELEMENT NAME
MATERIALS & COATING TECHNOLOGY

CODE
BACX2010

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name DAVID ENNIS
Address AMES RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 6

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1993 Number of Flights Duration of Flight, Days

OBJECTIVE
TO PROVIDE A TECHNOLOGY BASE FOR THE PRODUCTION OF STRUCTURAL AND INSULATING MATERIALS, AND OPTICAL, THERMAL, AND ABSORBING SURFACE COATINGS CAPABLE OF SUSTAINED PERFORMANCE IN THE SPACE ENVIRONMENT.

DESCRIPTION
DATA WILL BE OBTAINED ON THE EFFECT OF GIVEN CHARACTERISTICS OF THE SPACE ENVIRONMENT ON CRITICAL PHYSICAL PROPERTIES OF MATERIALS AND COATINGS ANTICIPATED FOR USE IN FUTURE SPACE PROJECTS. SPECIFIC AREAS OF INVESTIGATION INCLUDE THE DEGRADATION OF THE REFLECTIVITY OF MIRROR/ANTENNA METALLIC COATINGS AS WELL AS THE DECREASE IN THE ABSORBTIVITY OF LOW-SCATTER OPTICAL BLACK SURFACES WHEN EXPOSED TO SOLAR ILLUMINATION AND SOLAR WIND/COSMIC RAY HIGH ENERGY PARTICLE FLUXES. METEOROID VENTING OF THE INTERSTITIAL SPACES OF THERMAL INSULATING MATERIALS; DECREASES IN THE YOUNG'S MODULUS OF RESIN-MATRIX STRUCTURAL COMPOSITE MATERIALS DUE TO COSMIC-RAY DAMAGE AND VACUUM EFFECTS; AND PARTICLE CONTAMINATION OF THE THERMAL-CONTROL COATINGS APPLIED TO HEAT PIPES ARE ALSO TECHNOLOGY CONCERNS. THE DEVELOPED MISSION FACILITY WILL ALSO HAVE THE CAPABILITY FOR INVESTIGATIONS IN THE AREA OF SPACE POLYMER CHEMISTRY.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg . Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	
Standby		( ) Continuous
Peak		

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
(X) On-Board Data Processing Required
Description:
Data Types: (X) Analog (X) Digital Hours/Day 0.00
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: W, m: H, m: Stowed
L, m: W, m: H, m: Deployed
Launch mass, kg: Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions
HIS MISSION INTEGRATED INTO BACX2035

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities
- Up
- Down
- Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

PAYLOAD ELEMENT NAME
CRYOGENIC FLUID STORAGE TECH

CODE
BACX2015

CONTACT
Name S.C. AYDECOTT
Address LEWIS RESEARCH CENTER

Telephone 216/433-4000 X66

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 16

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO DEVELOP THE TECHNOLOGY FOR ADVANCED INSULATION AND LONG LIFE REFRIGERATION/LIQUEFACTION SYSTEMS TO PROVIDE LONG TERM ORBITAL THERMAL CONTROL OF CRYOGENIC LIQUID STORAGE AND SUPPLY TANKS.

DESCRIPTION
SUBSCALE CRYOGENIC FLUID STORAGE TANKS AND REFRIGERATION/LIQUEFACTION SYSTEMS WOULD BE TESTED TO ESTABLISH THERMAL PERFORMANCE AND USEFUL LIFE DURING THE EARLY PHASES OF THE SPACE STATION EVOLUTIONARY PROCESS. SELECTED CONCEPTS WILL THEN PROVIDE DESIGN CRITERIA FOR CRYOGENIC FLUID STORAGE AND SUPPLY SYSTEM TO PROVIDE SPACE OPERATIONS CENTER CONSUMABLES AND ORBIT TRANSFER VEHICLE PROPELLANTS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	40	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed
L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed
Launch mass, kg: 0 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions
THIS TDM HAS BEEN INTEGRATED WITH BACX2064.

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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PAYLOAD ELEMENT NAME
CRYOGENIC LIFETIME TECHNOLOGY

CODE
BACX2016

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 16

CONTACT
Name DAVID ENNIS
Address AMES RESEARCH CENTER

Telephone 415/965-6525

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE A TECHNOLOGY BASE FOR THE LONG-TERM STORAGE OF CRYOGENIC FLUIDS IN THE SPACE ENVIRONMENT.

DESCRIPTION
THE PROPOSED MISSION WILL EVALUATE DIVERSE ADVANCED ACTIVE AND PASSIVE TECHNOLOGIES FOR THE MAINTENANCE OF CRYOGENIC TEMPERATURES IN SPACE ON A MULTI-YEAR TIMESCALE. CANDIDATE TECHNOLOGICAL AREAS TO BE INVESTIGATED INCLUDE, AMONG OTHERS, THE CONTACTLESS OPERATION OF MAGNETIC BEARINGS, THE PASSIVE ORBITAL DISCONNECT SYSTEM (PODS), AND THE DROPLET RADIATOR. A SPACEBORNE CRYOGENIC FACILITY OF THIS TYPE WILL ALSO PROVIDE AN OPPORTUNITY FOR TECHNOLOGICAL AND SCIENTIFIC EXPERIMENTS INCLUDING THE TESTING OF THE DIMENSIONAL STABILITY OF STRUCTURAL MATERIALS UNDERGOING THERMAL CYCLING AND CRITICAL LOW-TEMPERATURE PHYSICS INVESTIGAT

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed
L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed
Launch mass, kg: 0 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions
THIS TDM HAS BEEN INTEGRATED INTO BACX2064.

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)
Mass:	0 kg					

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

PAYLOAD ELEMENT NAME
FLUID MANAGEMENT TECHNOLOGY

CODE
BACX2017

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 16

CONTACT
Name T.L. LABUS
Address NASA-LEWIS RESEARCH CTR

Telephone 216/433-4000 X29

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 6

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year 1992 Number of Flights 1 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE A TECHNOLOGY BASE FOR SYSTEMS REQUIRING STORAGE, ACQUISITION AND TRANSFER OF EARTH STORABLES UNDER CONTROLLED REDUCED GRAVITATIONAL CONDITIONS.

DESCRIPTION
THE MISSIONS PROPOSED WILL PROVIDE THE TECHNOLOGY FOR THE LONG TERM STORAGE, ACQUISITION AND TRANSFER OF BOTH SINGLE AND TWO-PHASE FLUIDS. KEY ISSUES REGARDING FLUID MECHANICS, HEAT TRANSFER AND THERMODYNAMICS OF THESE COMPLEX PHYSICAL SYSTMS NEED TO BE ADDRESSED. SPECIFIC EXPERIMENTS MUST BE CONDUCTED ON SURFACE TENSION SCREEN ACQUISITION DEVICES, POOL BOILING, TWO-PHASE FLOW BOILING, FLUID REORIENTATION AND TRANSFER UTILIZING NONCRYOGENIC FLUIDS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0
Heat Rejection, w Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 7.00 W, m: 4.00 H, m: 3.00 Stowed
L, m: 7.00 W, m: 4.00 H, m: 3.00 Deployed
Launch mass, kg: 540 Return mass, kg: 540
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 2

Task Assignments

Skills (See Table B)

Skill	10	3				
Level	2	3				
Hours/Day	4	4				

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stowed)
Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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PAYLOAD ELEMENT NAME
TEST SOLAR-PUMPED LASERS

CODE
BACX2021

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 16

CONTACT
Name E.J. CONWAY
Address LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale =1

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO DEMONSTRATE, CALIBRATE, AND TEST THE OPERATION OF A SOLAR-PUMPED LASER USING THE AM-0 SOLAR SPECTRUM AND TO USE A LARGE, HIGH-QUALITY OPTICAL CONCENTRATOR DEPLOYED AND CHARACTERIZED AS AN EARLIER MISSION OBJECTIVE. TO PROVIDE A REALISTIC COMPARISON OF SEVERAL SOLAR LASER YPES.

DESCRIPTION
THE MISSION WILL DEMONSTRATE FOR THE FIRST TIME SOLAR-PUMPED LASING USING THE FULL SOLAR SPECTRUM (RATHER THAN A SIMULATED SPECTRUM). IT WILL PROVIDE FOR THE ACCURATE MEASUREMENT OF SOLAR LASER EFFICIENCY WHICH IS SPECTRUM AND TEMPERATURE-DEPENDENT AND WILL PROVIDE FOR LONG-TERM OPERATION TO ASSESS LASANT STABILITY AND LASANT RECONSTITUTION EFFICIENCY.

SEE TECHNOLOGY DEVELOPMENT MISSION BACX2056

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital

Hours/Day 0.00

Film (Amount): 0

Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00

Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0

Downlink command rate: 0

Recording Rate (KBPS) 0.00

Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed

L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed

Launch mass, kg: 0 Return mass, kg: 0

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0

Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval, days 0 Consumables, kg 0

Returnables, kg 0 Man hours 0.00

Configuration Changes: Interval, day 0 Man/Hours Required 0.00

Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stowed)
Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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PAYLOAD ELEMENT NAME
LASER-TO-ELECTRIC ENERGY CONVERS

CODE
BACX2022

CONTACT Name Address
E.J. CONWAY
NASA-LANGLEY RESEARCH CENTER

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 11

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 1

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO CHARACTERIZE AND COMPARE FOR SPACE OPERATION THE PERFORMANCE OF LASER TO-ELECTRIC POWER CONVERTERS, AND TO DEMONSTRATE SHORT-RANGE LASER-POWER TRANSMISSION IN SPACE.

DESCRIPTION
USING A SOLAR-PUMPED LASER DEPLOYED AND CHARACTERIZED UNDER AN EARLIER MISSION OBJECTIVE (SEE PAYLOAD BACX2056), TRANSMISSION OVER THE LONGEST SPACECRAFT DIMENSION WILL BE PERFORMED AND THE INTENSITY ATTERN AT THE CONVERTER SITE MEASURED. AN ASSESSMENT OF CONVERTER PERFORMANCE, EFFICIENCY, STABILITY OR LONG-TERM OPERATION AND RESISTANCE TO ENVIRONMENTAL INTERFERENCE OR DEGRADATION WILL BE PERFORMED OR A SET OF CONVERTORS.

SEE TECHNOLOGY DEVELOPMENT MISSION BACX2056.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

(X) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C Operational Minimum 0 Maximum 0

Non-operational Minimum 0 Maximum 0

Heat Rejection, w Operational Minimum 0 Maximum 0

Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed

L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed

Launch mass, kg: 0 Return mass, kg: 0

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval, days 0 Consumables, kg 0

Returnables, kg 0 Man hours 0.00

Configuration Changes: Interval, day 0 Man/Hours Required 0.00

Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

THIS MISSION INTEGRATED WITH BACX2021.

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

PAYLOAD ELEMENT NAME	CODE
SOLAR-SUSTAINED PLASMAS	BACK2023

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 11

CONTACT
Name E.J. CONWAY
Address LANGLEY CONTACT

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 1

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1996 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO DEMONSTRATE, CONTAIN, AND CHARACTERIZE SOLAR-SUSTAINED PLASMAS AND TO OPERATE, ASSESS, AND REFINE MHD ELECTRIC POWER GENERATION IN SPACE AND PLASMA THRUSTER PERFORMANCE.

REFER TO TD NO. 2056

DESCRIPTION
CONCENTRATED SUNLIGHT WILL EXCITE A PLASMA. CHARACTERISTICS OF THE PLASMA AND ITS CONTAINMENT SYSTEM WILL BE ASSESSED IN TERMS OF THEORETICAL PERFORMANCE AND PRIOR TERRESTRIAL TESTS. AFTER SUITABLE CONTROL AND UNDERSTANDING HAVE BEEN ACHIEVED, THE PLASMA WILL BE USED IN MHD ELECTRICAL GENERATING SYSTEMS TO IDENTIFY THEIR SPACE FEASIBILITY AND OPERATING CONSTRAINTS. THE PLASMA WILL ALSO BE ASSESSED AS THE EXHAUST MEDIUM FOR THERMAL PLASMA THRUSTERS AND FOR MPD THRUSTERS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

L, m: 6.00 W, m: 2.00 H, m: 1.00 Stowed

L, m: 6.00 W, m: 2.00 H, m: 1.00 Deployed

Launch mass, kg: 99 Return mass, kg: 0

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 1 Task Assignments

Skills (See Table B)

Skill	3					
Level	3					
Hours/Day	4					

EVA (X) Yes (X) No Reason SOLAR CONCENTRATOR Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval, days 0 Consumables, kg 0

Returnables, kg 0 Man hours 0.00

Configuration Changes: Interval, day 0 Man/Hours Required 0.00

Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

COMBINE THIS MISSION WITH BACX2008 & BACX2012 ON A POWER SYSTEMS TECHNOLOGY PLATFORM.

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

- - - PRICE [illegible]
ELECTRONIC ITEM

DATE 7-MAR-83 TIME 18:[illegible] FILENAME: RE[illegible]2.DAT
(283010)

SOLAR SUSTAINED PLASMAS

		UNIT WEIGHT	[illegible].00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	324.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	361.	-	361.
DESIGN	1267.	-	1267.
SYSTEMS	302.	-	302.
PROJECT MGMT	689.	-	689.
DATA	76.	-	76.
SUBTOTAL(ENG)	2696.	-	2696.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	1705.	-	1705.
TOOL-TEST EQ	1116.	-	1116.
SUBTOTAL(MFG)	2821.	-	2821.
TOTAL COST	5517.	-	5517.

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- - - PRICE 84 - - -
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:39 FILENAME: REID2.DAT
(283010)

... SUSTAINED PLASMAS

		UNIT WEIGHT	220.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	324.70	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	361.	-	361.
DESIGN	1267.	-	1267.
SYSTEMS	302.	-	302.
PROJECT MGMT	689.	-	689.
DATA	76.	-	76.
SUBTOTAL(ENG)	2696.	-	2696.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	1705.	-	1705.
TOOL-TEST EQ	1116.	-	1116.
SUBTOTAL(MFG)	2821.	-	2821.
TOTAL COST	5517.	-	5517.

DESIGN FACTORS	ELECTRONIC	MECHANICAL
WEIGHT	10.000*	210.000
DENSITY	42.300	0.648*
MFG. COMPLEXITY	10.357	7.300
NEW DESIGN	0.100	0.500
DESIGN REPEAT	0.000	0.000
EQUIPMENT CLASS	*****	*****
INTEGRATION LEVEL	0.0	0.0

PRODUCT DESCRIPTORS	
ENGINEERING COMPLEXITY	1.000
PROTOTYPE SUPPORT	1.0
PROTO SCHEDULE FACTOR	.250*
ELECT VOL FRACTION	.001*
PLATFORM	2.500
YEAR OF TECHNOLOGY	1987*
RELIABILITY FACTOR	1.0
MTBF(FIELD)	621e1*

SCHEDULE	START		FIRST ITEM		FINISH	
DEVELOPMENT	JAN 87	(14)	FEB 88*	(4)	NOV 88*	(23)

SUPPLEMENTAL INFORMATION

YEAR OF ECONOMICS	1984
ESCALATION	0.00
DEV COST MULTIPLIER	1.14

TOOLING & PROCESS FACTORS

DEVELOPMENT TOOLING	0.00

COST RANGES	DEVELOPMENT	PRODUCTION	TOTAL COST
FROM	4816.	-	4816.
CENTER	5517.	-	5517.
TO	6333.	-	6333.

PAYLOAD ELEMENT NAME
LASER COMM & TRACKING DEVELOP EX

CODE
BACX2025

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 12

CONTACT
Name JAMES E. RANDOLPH M/S 156-220
Address JPL - 4800 OAK GROVE DR.
PASADENA, CA 91109

Telephone 213/354-2732

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: Number of Flights Duration of Flight, Days

OBJECTIVE
TO PROVIDE THE TECHNOLOGY BASE FOR THE DEVELOPMENT OF MEDIUM-RANGE (<10 KM), LOW POWER (<100 MW) SOLID STATE LASER COMMUNICATION LINKS USING SPACE BASED LASER OPTICAL TECHNOLOGY. IN ADDITION, THE EXPERIMENT WOULD ENABLE THE DEVELOPMENT AND TESTING OF A VLSI SUPERWAFER LASER ARRAY.

DESCRIPTION
THE EXPERIMENT WOULD UTILIZE "NODE" ASSEMBLIES CONTAINING LASER SUPERWAFERS. "NODES" WOULD BE PLACED ON VARIOUS SPACE STATION APPENDAGES AND TELEOPERATOR. TESTS OF THE COMMUNICATION LINK BETWEEN THE SPACE STATION AND A TELEOPERATOR FOR VARIOUS ALTITUDES AND RANGES WOULD INCLUDE ACQUISITION AND TRACKING TESTS ALONG WITH MEASUREMENTS OF BIT ERROR PERFORMANCE. THE EXPERIMENTS WOULD VERIFY THAT SPHERICAL COMMUNICATIONS COVERAGE IS POSSIBLE AROUND THE SPACE STATION. THE EXPERIMENTS WOULD REQUIRE ADAPTIVE EXPERIMENTAL NODE PLACEMENT.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	100	8.00
Standby		
Peak		

(X) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
(X) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
L, m: 1.00 W, m: 1.00 H, m: 1.00 Stowed
L, m: 1.00 W, m: 1.00 H, m: 1.00 Deployed
Launch mass, kg: 100 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill	8						
Level	3						
Hours/Day							

EVA ( ) Yes (X) No Reason Hours/EVA

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

	OPS CODE
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS

Platform Based

	OPS CODE
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS

Other

	OPS CODE
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down		days
OTV or TMS on Orbit		days
Mission Use		days/year
IVA Service		man-days/year
EVA Service		man-days/year
Experiment Ops	50	man-days/year
Service Frequency		times/year

Delta Velocities
Up
Down
Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)
Mass:	kg					

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload

PAYLOAD ELEMENT NAME
MULTI-FREQ HIGH GAIN ANTENNA

CODE
BACX2026

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 10

CONTACT
Name JAMES E. RANDOLPH M/S 156-220
Address JPL, 4800 OAK GROVE DR
PASADENA, CA 91109

Telephone 213/354-2732

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 8

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1996 Number of Flights Duration of Flight, Days

OBJECTIVE
TO DEVELOP THE TECHNOLOGY BASE FOR DUAL FREQUENCY HIGH GAIN MULTI-FREQUENCY ANTENNAS

DESCRIPTION
THE EXPERIMENT WILL CONSIST OF A MULTI-FREQUENCY ANTENNA WITH MECHANICAL APERATURE CONTROL AND LIMITED ELECTRONIC STEERING OF THE COMPOSITE BEAM TO COMPENSATE FOR FINE ERRORS OF APERATURE MOTION AND MOVEMENT OF THE SPACE STATION. THE EXPERIMENT WILL DEMONSTRATE COMPOSITE PATTERN CONTROL AND STABILITY WHEN COMMUNICATING WITH SPACECRAFT IN SYNCHRONOUS ORBITS. COMMUNICATIONS LINKS WILL BE INVESTIGATED, FREQUENCY OPTIONS WILL BE STUDIED, AND OPTIMUM COMBINATIONS WILL BE IDENTIFIED. FREQUENCY SELECTIVE REFLECTORS, DICHRO SCREENS, MULTI-FREQUENCY ANTENNAS WITH MECHANICAL APERATURE STEERING AND ELECTRONIC PATTERN STABILIZATION WILL BE DEVELOPED. AN ENGINEERING MODEL OF THE MULTI-FREQUENCY ANTENNA WILL BE TESTED IN SPACE.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s .

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	1000	12.00
Standby		
Peak		

(X) Continuous

Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None (X) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
(X) On-Board Data Processing Required
Description:
Data Types: ( ) Analog (X) Digital Hours/Day
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

THERMAL
( ) Active (X) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, w Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function ( ) Pressurized (X) Unpressurized
L, m: 1.00 W, m: 1.00 H, m: 1.00 Stowed
L, m: 3.00 W, m: 3.00 H, m: 1.00 Deployed
Launch mass, kg: 100 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size Task Assignments
Skills (See Table B)

Skill	11	12	13	7	8	
Level	3	3	3	3	3	
Hours/Day						

EVA (X) Yes ( ) No Reason INSTALLATION Hours/EVA 8.00

SERVICING/MAINTENANCE
Service: Interval, days Consumables, kg
Returnables, kg Man hours
Configuration Changes: Interval, day Man/Hours Required
Deliverables, kg Returnables, kg

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
(X) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
- (X) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down		days
OTV or TMS on Orbit		days
Mission Use	180	days/year
IVA Service		man-days/year
EVA Service		man-days/year
Experiment Ops		man-days/year
Service Frequency		times/year

Delta Velocities
- Up
- Down
- Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)
Mass:	kg					

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab
Number of Appendages
Number of Modules Required to Assemble the Payload 3

PAYLOAD ELEMENT NAME
LASER PROPULSION TEST

CODE
BACX2028

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 13

CONTACT
Name E.J. CONWAY
Address NASA-LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 5

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: Number of Flights Duration of Flight, Days

OBJECTIVE
TO MEASURE THE THRUST AND SPECIFIC IMPULSE OF ONE OR MORE LASER PROPULSION SYSTEMS, AND TO ASSESS THE ADEQUACY OF GROUND-BASED MEASUREMENTS, AND TO TEST THE LIFE EXPECTANCY OF A LASER ENGINE.

DESCRIPTION
THE MISSION WILL BE THE FIRST SYSTEMS-LEVEL TEST OF LASER PROPULSION IN SPACE. IT WILL TEST THRUST AND SPECIFIC IMPULSE AS WELL AS SYSTEM CHARACTERISTICS SUCH AS STEADY-STATE WALL TEMPERATURE, PROPELLANT MASS FLOW RATE. A HIGH-POWER LASER, EITHER SOLAR-PUMPED OR ELECTRICALLY PUMPED, WILL BE REQUIRED FOR THIS MISSION. LIFE TESTS WILL BE PERFORMED.

SEE TECHNOLOGY DEVELOPMENT MISSION BACX2056.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed
L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed
Launch mass, kg: 0 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments
Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions
THIS MISSION COMBINED WITH BACX2021 AND BACX2022 (REFER TO BACX2021 FOR DESCRIPTION)

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

PAYLOAD ELEMENT NAME
MANIPULATOR CONTROLS TECH

CODE
BACX2030

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 14

CONTACT
Name JACK PENNINGTON/A.J. MEINTEL
Address NASA-LANGLEY RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale =

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: Number of Flights Duration of Flight, Days

OBJECTIVE
1) DETERMINE THE CHARACTERISTICS AND LIMITATIONS OF INTERACTIVE AND ADAPTIVE CONTROL TECHNOLOGY APPLIED TO SPACE TELEOPERATOR SYSTEMS.
2) TO DEVELOP A QUANTITATIVE DATA BASE WITH WHICH TO COMPARE AND PREDICT TASK PERFORMANCE WITH TELEOPERATION AND IN A SPACE SUIT.

DESCRIPTION
A LIGHTWEIGHT LOW-INERTIAL DUAL-ARM MANIPULATOR SYSTEM WILL BE ATTACHED TO THE SPACE STATION OR ASSOCIATED STRUCTURE. THE MANIPULATOR SYSTEM WILL BE CONTROLLED FROM A TELEOPERATOR CONTROL STATION IN THE SPACE STATION, THROUGH A COMPUTER INTERFACE, USING BOTH SUPERVISORY AND DIRECT CONTROL MODES. INITIALLY, THE MANIPULATOR SYSTEM WILL BE IN A SPACE STATION LABORATORY. TESTS WITHIN THE LABORATORY WILL INCLUDE EVALUATIO OF SYSTEM RESPONSE-TO VALIDATE GROUND BASED MODELS, TO IDENTIFY SYSTEM PARAMETERS, AND TO DEVELOP ADAPTIVE CONTROL ALGORITHMS FOR ZERO-G OPERATIONS. EXPERIMENTS WILL PROVIDE DATA ON OPERATOR RESTRAINTS, WORKLOAD, MOBILITY, AND RESPONSE TO BILATERAL FORCES. BASELINE TESTS WILL BE CONDUCTED TO COMPARE TASK PERFORMANCE USING THE TELEOPERATOR WITH PERFORMANCE IN A SPACE SUIT. IN ADDITION TO TESTS WITHIN THE SPACE STATION THE TELEOPERATOR SYSTEM WILL BE ATTACHED TO A CARRIER VEHICLE SUCH AS TMS TO DEVELOP THE TECH AND INTEGRATED PRO

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

(X) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed

L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed

Launch mass, kg: 0 Return mass, kg: 0

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0

Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval, days 0 Consumables, kg 0

Returnables, kg 0 Man hours 0.00

Configuration Changes: Interval, day 0 Man/Hours Required 0.00

Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
- ( ) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stowed)
Length: 0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
- (X) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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PAYLOAD ELEMENT NAME
SATELLITE SERVICING TECHNOLOGY

CODE
BACX2031

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name WILLIAM WALES
Address MARSHALL SPACE FLIGHT CE

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale =

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: Number of Flights Duration of Flight, Days

OBJECTIVE
TO PROVIDE THE TECHNOLOGY REQUIRED TO SERVE FREE-FLYING SPACECRAFT/ SATELLITE AT AN ORBITAL SUPPORT FACILITY. THE SERVICING OF SATELLITES INCLUDES NOT ONLY PERIODIC SUPPORT BUT REPAIR AND CHECKOUT OF DEFECTIVE SATELLITE SYSTEMS. THE RETRIEVAL AND REDEPLOYMENT MAY BE A FUNCTION OF THE SPACE STATION; HOWEVER, IT IS NOT A PART OF THIS TECH DEVELOP MISSIO

DESCRIPTION
THE PROPOSED MISSION(S) ARE REQUIRED TO DEVELOP THAT TECHNOLOGY NEEDED FOR SERVICING SATELLITES IN SPACE AT A MANNED FACILITY AND/OR REMOTELY FROM THE MANNED FACILITY. THE ISSUES OF MAJOR CONCERN ARE: SUBSYSTEMS MODULE REPLACEMENT AND CHECKOUT, GRAPPLE/ATTACHMENT TECHNIQUES, FLUID TRANSFER, REMOTE SERVICING/CHECKOUT, AND ORBITAL ASSEMBLY OF SATELLITES (LIMITED). THE TECHNOLOGY DEVELOPMENT MISSION(S) SELECTED WILL REPRESENT A CROSS SECTION OF THOSE SATELLITE FUNCTIONS AND SERVICES REQUIRED FROM THE SUPPORT FACILITY.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

(X) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed
L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed
Launch mass, kg: 0 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions

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Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stoved)
Length:	0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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PAYLOAD ELEMENT NAME
OTV SERVICING TECH

CODE
BACX2032

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 15

CONTACT
Name WILLIAM WALES
Address MARSHALL SPACE FLIGHT CE

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE THE TECHNOLOGY REQUIRED TO MAINTAIN AN ORBITAL TRANSFER VEHICLE (OTV) ON-ORBIT BETWEEN FLIGHTS. EARLY IMPLIFIED EXPERIMENTS IN THE OTV TECHNOLOGY EVOLUTION COULD BE PERFORMED IN GROUND FACILITIES OR FROM THE ORBITER, HOWEVER, THE MORE COMPLEX, LONGER DURATION TESTS/ EXPERIMENTS WILL REQUIRE THE SUPPORT OF THE SPACE STATION.

DESCRIPTION
THE PROPOSED MISSION(S) ARE REQUIRED TO DEVELOP THE TECHNOLOGY NEEDED FOR SERVICING THE ORBITAL TRANSFER VEHICLE SYSTEM AND MAINTAINING IT FROM AN ORBIT BASE. THOSE ISSUES OF MAJOR CONCERN ARE: THE REFUELING, GAUGING AND PRESERVATION OF THE OTV PROPELLANTS; THE MAINTENANCE, REPLACEMENT AND CHECKOUT OF AVIONICS COMPONENTS; THE SERVICING AND REPLACEMENT OF PROPULSION SYSTEM COMPONENTS; INSTALLATION OF ANY AERODYNAMIC BRAKING OR AEROMANEUVERING SYSTEM; AND THE INTEGRATION AND CHECKOUT OF THE OTV WITH ANOTHER STAGE, SINGLE OR MULTIPLE TYPE PAYLOADS; AND/OR A MANNED CREW TRANSFER MODULE.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 0 Perigee, km 0 Tolerance + 0 - 0
Inclination, deg 0.0 Tolerance + 0 - 0
Nodal Angle, deg 0 Ephemeris Accuracy, m 0
Escape dV Required, m/s 0.0

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg) 0.00
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

(X) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, w	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
L, m: 0.00 W, m: 0.00 H, m: 0.00 Stowed
L, m: 0.00 W, m: 0.00 H, m: 0.00 Deployed
Launch mass, kg: 0 Return mass, kg: 0
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval, days 0 Consumables, kg 0
Returnables, kg 0 Man hours 0.00
Configuration Changes: Interval, day 0 Man/Hours Required 0.00
Deliverables, kg 0 Returnables, kg 0

SPECIAL CONSIDERATIONS/See Instructions
THIS MISSION HAS BEEN SUBDIVIDED INTO 5 OTV TECHNOLOGY DEMONSTRATION MISSIONS - SEE BACK2063 THRU BACK2067

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY
( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Stowed)
Length:	0.00 meters	Width: 0.00 meters	Height: 0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions
(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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PAYLOAD ELEMENT NAME
SPACECRAFT STRAIN & ACOUSTIC EMI

CODE
BACX2033

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name JOSEPH HEYMAN
Address

Telephone 804/827-3418

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
DEVELOP TECHNOLOGY NECESSARY TO EXAMINE SPACECRAFT STRUCTURES AND PROVIDE LONG-TERM STRUCTURAL VERIFICATION THROUGH ADVANCED NONDESTRUCTIV EVALUATION (NDE). TEST SUCH SYSTEMS ON EARLY SPACECRAFT MISSIONS AND IMPROVE TO MEET MONITORING NEEDS.

DESCRIPTION
ADVANCED ACOUSTIC EMISSION SENSORS DESIGNED AND BUILT INTO THE SPACECRAFT STRUCTURE WILL BE MONITORED DURING THE MISSION BY A PREPROGRAMMED COMPUTER. THE SENSORS WILL BE DEVELOPED AND TESTED ON THE GROUND AND WILL TAKE ADVANTAGE OF OUR CURRENT R&D PROGRAM OUTPUT TO PROVIDE STATE-OF-THE-ART SENSORS. ADDITIONAL SENSORS DESIGNED TO MONITOR STRAIN WITH ACOUSTICS AND FIBER-OPTIC INTERFEROMETRIC SENSORS WHICH HAVE BEEN DEVELOPED AT LARC WILL BE STRUCTURALLY INTEGRATED AS WELL.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00
Voltage, V	0	

( ) Continuous
Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments
Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INTEGRATED INTO LSS-5.

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PAYLOAD ELEMENT NAME
LARGE STRUCTURES TECH EXPERIMENT

CODE
BACX2038

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name
Address
PO BOX 3999
SEATTLE, WA 98124

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE A TECHNOLOGY BASE FOR THE DESIGN AND ANALYSIS OF VERY LARGE SPACE STRUCTURES HAVING DIMENSIONS LARGER THAN ARE COMPATIBLE WITH SPACE SHUTTLE EXPERIMENTS.

DESCRIPTION
ASSEMBLY AND TESTING OF VERY LARGE SPACE STRUCTURES WILL REQUIRE UTILIZATION OF THE SPACE STATION AS A BASE FOR THESE ACTIVITIES. MAINTAINING A LONG LIFETIME STABLE PLATFORM FOR ASSEMBLY AND INERTIAL STRUCTURAL CHARACTERIZATION TESTING IS IMPORTANT FOR THE EVOLUTION OF LARGE STRUCTURE TECHNOLOGY. A LARGE FACILITY THAT CAN BE USED FOR ASSEMBLY AND ENVIRONMENTAL TESTING WOULD BE REQUIRED ON THE SPACE STATION. THIS FACILITY WOULD INCLUDE DATA ACQUISITION AND ANALYSIS CAPABILITIES MECHANICAL OPERATIONS SUPPORT AND MAINTENANCE CAPABILITIES, AND A SUPPLY OF GOODS AND TOOLS TO ALLOW MODIFICATIONS TO LARGE STRUCTURE DESIGNS WHILE ON-ORBIT. COMPLETE DYNAMIC TESTING CAPABILITIES WILL BE REQUIRED TO DETERMINE MODE SHAPES, INERTIAL PROPERTIES, DAMPING/INFLUENCE COEFFICIENTS, AND OTHER DESIGN PARAMETERS NECESSARY TO CHARACTERIZE THE STABILITY AND DYNAMICS OF VERY LARGE SPACE STRUCTURES.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	( ) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)

Launch mass, kg: 0 Return mass, kg:

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0

Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day	0.00	0.00	0.00			

EVA ( ) Yes (X) No Reason CONSTRUCTION Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval 0 days Consumables 0 kg

Returnables 0 kg Man hours required 0.00

Configuration Changes: Interval 0 days Man/Hours Required 0.00

Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions

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PAYLOAD ELEMENT NAME
ATTITUDE CONTROL-SYSTEM IDENT EX

CODE
EACX2039

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name JAMES E. RANDOLPH
Address C.I.T. J.P.L.
4800 OAK GROVE DR.
PASADENA, CA 91109

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO VALIDATE SENSING STRATEGY/MECHANIZATION, IDENTIFICATION ALGORITHMS AND INTEGRATED FLIGHT CONTROL DYNAMICS RECONSTRUCTION SUBSYSTEM; ESTABLISHING OFF-LINE AND REAL-TIME KNOWLEDGE OF FLEXIBLE SPACE STATION AND PAYLOAD DYNAMICS.

DESCRIPTION
THE EXPERIMENT WILL CONSIST OF DISTRIBUTED EXCITATION AND SENSING OF STRUCTURE AND PAYLOADS. SENSOR OUTPUTS WILL BE RECORDED FOR OFF-LINE SYSTEM IDENTIFICATION OR PROCESSED SEQUENTIALLY FOR ON-BOARD IDENTIFICATION.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	( ) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments
Skills (See Table B)

Skill						
Level						
Hours/Day	0.00	0.00	0.00			

EVA ( ) Yes (X) No Reason CONSTRUCTION Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INCORPORATED INTO LSS-3 AND LSS-4.

PAYLOAD ELEMENT NAME
ATTITUDE CONTROL-ADAPTIVE CONTRO

CODE
BACX2040

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name JAMES E. RANDOLPH
Address C.I.T. J.P.L.
4800 OAK GROVE DR.
PASADENA CA 91109

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO VALIDATE PERFORMANCE AND STABILITY IMPROVEMENT SENSING STRATEGIES AND MECHANIZATION, CONTROL GAIN UPDATE SUBROUTINES AND RECOFIGURATION SCHEMES, AND ADAPTIVE CONTROL ALGORITHMS.

DESCRIPTION
THIS EXPERIMENT WILL EVALUATE ADAPTIVE CONTROL ALGORITHMS AND MEASUREMENT HIERARCHY FOR AN EVOLVING OR DEPLOYING STRUCTURE. IT WILL INCLUDE ARTICULATION AND RECONFIGURATION OF PAYLOADS TO CHANGE SYSTEM MASS PROPERTIES AND EVALUATE ADAPTIVE CONTROL DESIGNS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)

Launch mass, kg: 0 Return mass, kg:

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

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CREW REQUIREMENTS

Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day	0.00	0.00	0.00			

EVA ( ) Yes (X) No Reason CONSTRUCTION Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval 0 days Consumables 0 kg

Returnables 0 kg Man hours required 0.00

Configuration Changes: Interval 0 days Man/Hours Required 0.00

Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions

THIS MISSION HAS BEEN INTEGRATED INTO LSS-3.

PAYLOAD ELEMENT NAME
ATTITUDE CONTROL DIST CONTROL EX

CODE
BACX2041

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name JAMES E. RANDOLPH
Address CALIF INST OF TECH J.P.L
4800 OAK GROVE DR.
PASADENA, CA 91109

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO VALIDATE HARDWARE, ALGORITHMS AND SYSTEMS FOR ACTIVE VIBRATION DAMPING, COOPERATIVE PAYLOAD POINTING, MODULAR CONTROL, CONTROL DURING DEPLOYMENT, AND PRECISION POINTING/STABILIZATION.

DESCRIPTION
THE EXPERIMENT CONSISTS OF MULTI-POINT PAYLOAD VIBRATION/SHAPE SENSING WITH A SENSOR ATTACHED TO SPACE STATION. DISTRIBUTED ACTUATION ALONG WITH THE EXPERIMENTAL STRUCTURE WILL ALLOW OPTIMAL PLACEMENT OF ACTUATORS AND CONTROL SCHEMES, ARTICULATION AND DEPLOYMENT OF PAYLOADS WILL ASSIST IN FURTHER UNDERSTANDING OF CONTROL VARIATIONS AS THE STRUCTURAL CONFIGURATION CHANGES. A CONTROLLED COUPLING WOULD EXIST AT THE INTERFACE BETWEEN THE STRUCTURE AND THE SPACE STATION.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)

Launch mass, kg: 0 Return mass, kg:

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day	0.00	0.00	0.00			

EVA ( ) Yes (X) No Reason CONSTRUCTION Hours/EVA 0.00

SERVICING/MAINTENANCE

Service: Interval 0 days Consumables 0 kg

Returnables 0 kg Man hours required 0.00

Configuration Changes: Interval 0 days Man/Hours Required 0.00

Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions

THIS MISSION HAS BEEN INTEGRATED INTO LSS-3.

PAYLOAD ELEMENT NAME
ZERO-G ANTENNA RANGE COMM EXPERI

CODE
BACX2042

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name JAMES E. RANDOLPH M/S 156-220
Address JPL 4800 OAK GROVE DR.
PASADENA, CA 91109

Telephone 213/354-2732

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO EXPEDITE THE DEVELOPMENT OF LARGE DIAMETER ANTENNAS FOR COMMUNICATION SATELLITES, OVLBI, ODSRS, ETC., PROVIDING A REALISTIC ENVIRONMENT FOR DEVELOPMENT AND PROTOTYPE QUALIFICATION TESTING OF SUBSYSTEMS AND EQUIPMENT FOR CONTROL OF SURFACE DISTORTIONS AND FEED STRUCTURE DEFLECTIONS.

DESCRIPTION
A FACILITY WOULD BE DEVELOPMENT TO PROVIDE IN SITU PATTERN MEASUREMENTS OF ANTENNA BEAM QUALITY AND MULTIPLE SIMULTANEOUS BEAM ISOLATION. A SPACE STATION BASED TMS WOULD BE USED TO PROVIDE RF PATTERN ILLUMINATION.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stoved)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0

Skills (See Table B)

Task Assignments

Skill						
Level						
Hours/Day	0.00	0.00	0.00			

EVA ( ) Yes (X) No Reason CONSTRUCTION Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INTEGRATED INTO LSS-3.

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PAYLOAD ELEMENT NAME
DYNAMICS OF LIGHTLY LOADED STRUC

CODE
BACX2043

CONTACT
Name B.R. HANKS
Address
PASADENA, CA 91109

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
DETERMINE DYNAMIC CHARACTERISTICS OF LARGE STRUCTURAL SYSTEMS FOR USE IN ORBITAL OPERATIONS WHERE STATIC LOAD REQUIREMENTS ARE SMALL. THE DYNAMIC STIFFNESS AND DAMPING CHARACTERISTICS OF STRUCTURES SUCH AS ANTENNA DISHES AND MANIPULATOR SYSTEMS WHICH WOULD BE NON-FUNCTIONAL IN 1-G WILL BE STUDIED.

DESCRIPTION
CANDIDATE STRUCTURES WOULD BE DEPLOYED OR ERECTED USING SPACE STATION AS STABLE PLATFORM. GENERAL SIZE CLASS WOULD BE 30-100 M. DYNAMIC INPUTS WOULD BE PROVIDED AND RESPONSE DATA MEASURED USING SPACE STATION AS A LABORATORY. EXPERIMENT DURATION MAY BE ONE WEEK OR MORE.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0
Heat Rejection, W Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

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CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day	0.00	0.00	0.00			

EVA ( ) Yes (X) No Reason CONSTRUCTION Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INCORPORATED INTO LSS-3.

PAYLOAD ELEMENT NAME
SPACECRAFT MATERIALS TECHNOLOGY

CODE
BACK2044

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name C.F. SYKES
Address LANGLEY

Telephone 804/827-3110

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE A TECHNOLOGY DATA BASE FOR LONG TERM USE OF ADVANCED MATERIALS IN SPACE.

DESCRIPTION
THE PROPOSED MISSION WOULD PROVIDE A UNIQUE OPPORTUNITY TO DEVELOP A LONG TERM SPACE ENVIRONMENTAL DURABILITY DATA BASE ON ADVNCED THERMAL CONTROL COATINGS, ADHESIVES, COMPOSITES, AND POLYMER FILMS. SPECIFIC EXPERIMENTS WOULD BE DEVELOPED TO EVALUATE THE EFFECTS OF EACH EXPOSURE PARAMETER, BOTH SINGLY AND COMBINED, ON THE PROPERTIES OF THESE MATERIALS. IN SITU EVALUATION OF PROPERTIES COULD BE PERFORMED.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

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CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE

Service:	Interval	0 days	Consumables	0 kg
	Returnables	0 kg	Man hours required	0.00
Configuration Changes:	Interval	0 days	Man/Hours Required	0.00
	Deliverables	0 kg	Returnables	0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INTEGRATED INTO LSS-5.

PAYLOAD ELEMENT NAME
SPACECRAFT CONTROL TECH DEVELOPM

CODE
BACK2045

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A)   0

CONTACT
Name   L.W. TAYLOR JR
Address   LNGL

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational   ( ) Approved   ( ) Planned   ( ) Candidate   (X) Opportunity

Desired First Flight, Year: 0   Number of Flights 0   Duration of Flight, Days 0

OBJECTIVE
EVALUATE ADAPTIVE CONTROL TECHNIQUES REQUIRED BY ADVANCED SPACE STATION CONFIGURATIONS. THESE ADAPTIVE CONTROL TECHNIQUES WILL INCLUDE CLOSED-LOOP SYSTEMS IDENTIFICATION.

DESCRIPTION
ADVANCED ADAPTIVE CONTROL LAWS WILL BE PROVIDED AS SELECTABLE ALTERNATIVES TO OPERATIONAL CONTROL LAWS, VARIOUS ADVANCED TECHNIQUES WILL BE EVALUATED WITH THE OPERATIONAL SYSTEM SERVING AS A BACKUP.

ORBIT CHARACTERISTICS
Geosynchronous Orbit   ( ) Yes   (X) No
Apogee, km   Perigee, km   Tolerance + -
Inclination, deg   Any   Tolerance + -
Nodal Angle, deg   Any   Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction   ( ) Inertial   ( ) Solar   ( ) Earth   (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00   Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC   ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS

Monitoring Requirements:
( ) None   ( ) Realtime   ( ) Offline   ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0   Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog   ( ) Digital   Hours/Day 0.00
Film (Amount): 0   Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00   Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0   Downlink command rate: 0
Recording Rate (KBPS) 0.00   Downlink Frequency (MHz): 0.00

THERMAL

(X) Active   ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal   ( ) External   ( ) Remote
Equipment ID/Function   (X) Pressurized   ( ) Unpressurized
Length: 0.00 meters   Width: 0.00 meters   Height: 0.00 meters (Stowed)
Length: 0.00 meters   Width: 0.00 meters   Height: 0.00 meters (Deployed)
Launch mass, kg: 0   Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g)   min: 0.00E+00   max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0   Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No   Reason   Hours/EVA 0.00

SERVICING/MAINTENANCE

Service:	Interval	0 days	Consumables	0 kg
	Returnables	0 kg	Man hours required	0.00
Configuration Changes:	Interval	0 days	Man/Hours Required	0.00
	Deliverables	0 kg	Returnables	0 kg

SPECIAL CONSIDERATIONS/See instructions

THIS MISSION HAS BEEN INTEGRATED INTO LSS-3.

PAYLOAD ELEMENT NAME
ADVANCED CONTROL DEVICE TECH DEM

CODE
EACX2046

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name C.R. KECKLEV
Address LANGLEY

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
EVALUATE MOMENTUM STORAGE CONTROL DEVICES (E.G., THIRD GENERATION CONTRO MOMENT GYROS (CMG'S), SECOND GENERATION MAGNETICALLY SUSPENDED MOMENTUM RINGS (ACMD'S)) REQUIRED BY ADVANCED SPACE STATION CONFIGURATIONS.

DESCRIPTION
ADVANCED CONTROL DEVICES WILL BE PROVIDED AS SELECTABLE ALTERNATIVES TO OPERATIONAL CONTROL DEVICES. VARIOUS ADVANCED DEVICES WILL BE EVALUATED WITH THE OPERATIONAL SYSTEM SERVING AS A BACKUP.

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km
Perigee, km
Tolerance + -
Inclination, deg Any
Tolerance + -
Nodal Angle, deg Any
Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00
Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

(X) Continuous

Voltage, V 0
Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments
Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INTEGRATED INTO LSS-3.

PAYLOAD ELEMENT NAME
THERMAL SHAPE CONTROL TECHNOLOGY

CODE
BACX2047

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name H.H. ADELMAN
Address

Telephone 827-3451

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
DETERMINE THE FEASIBILITY OF CONTROLLING SHAPE DISTORTION BY ON-BOARD HEATING.

DESCRIPTION
A LARGE FLEXIBLE PANEL WILL BE ATTACHED TO THE SPACE STATION. HEATERS WILL BE MOUNTED TO THE PANEL AT A NUMBER OF LOCATIONS. SENSORS LOCATED ON THE PANEL WILL DETECT DEVIATIONS FROM THE REQUIRED SHAPE AND TRIGGER THE HEATERS TO GENERATE A TEMPERATURE DISTRIBUTION IN THE PANEL WHICH WILL OFFSET THE UNWANTED DISTORTIONS.

ORIGINAL PAGE IS OF POOR QUALITY

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0

Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INTEGRATED INTO LSS-3.

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PAYLOAD ELEMENT NAME
ACTIVE OPTICS TECHNOLOGY

CODE
BACX2048

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name DAVID ENNIS
Address AMES RESEARCH CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE A TECHNOLOGY BASE FOR THE OPERATION AND CONSTRUCTION OF LARGE-APERTURE SEGMENTED MIRRORS HAVING HIGH SURFACE ACCURACY OPTICAL FIGURE.

DESCRIPTION
THE PROPOSED MISSION WILL INVESTIGATE CRITICAL TECHNOLOGICAL ISSUES GERMANE TO THE USE OF LARGE MULTI-SEGMENTED ACTIVE REFLECTORS IN FUTURE SPACE PROJECTS. KEY AREAS OF EXPERIMENTATION ARE MAINTENANCE OF SURFACE FIGURE AND SEGMENT ORIENTATION THROUGH POSITIONAL ACCUATORS AND CONTROL ALGORITHMS; MEASUREMENT OF OPTICAL IMAGE QUALITY THROUGH WAVEFRONT SENSING AND LASER RANGING TECHNIQUES; DEPLOYMENT, ERECTION, AND MECHANICAL VIBRATION CONTROL OF THE TRUSS SUPPORT STRUCTURE FOR THE PRIMARY MIRROR; AND, ACCURATE ANGULAR POINTING OF THE ANTENNA ASSEMBLY. SINCE THE TECHNOLOGICAL READINESS OF THE ASSEMBLED REFLECTOR WILL BE CONFIRMED BY ASTRONOMICAL OBSERVATIONS, TECHNOLOGICAL ISSUES RELATING TO INFRARED DETECTORS AND ASSOCIATED CRYOGENIC ENGINEERING; MICROWAVE RECEIVERS, AND OPTICAL FIBERS WILL ALSO BE ADDRESSED.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stoved)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN INTEGRATED INTO LSS-4.

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PAYLOAD ELEMENT NAME
GEODESIC SPHERICAL STRUCTURES TE

CODE
EACK2049

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name
Address

DAVID H. SUDDETH
GARY F. BARNHARD
JACK EVANS
GODDARD SPACE FLIGHT CEN

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO DEVELOP THE TECHNOLOGY FOR NEW, SELF-SUPPORTING, STABLE AND HIGHLY RIGID STRUCTURES FOR SPACECRAFT AND SPACE SYTEMS BASED ON GEODESIC DESIGN PRINCIPLES.

DESCRIPTION
THIS MISSION CAN PROVIDE THE TECHNOLOGY BASE REQUIRED TO BUILD AND UTILIZE GEODESIC STRUCTURES WITH HIGH RIGIDITY, EXPANDIBILITY AND REUSABILITY IN SPACE ENVIRONMENTS. AN EXAMPLE OF GEODESIC STRUCTURE IS A 22 FT DIAMETER "SPHERE" CONSTRUTED FROM 20 EQUILATERAL TRIANGLE COMPONENTS, ALL OF WHICH HAVE THE SAME SIZE AND SHAPE WITH A SIDE LENGTH OF 12 FT. THE TRIANGULAR COMPONENTS COULD EASILY FIT INTO THE SPACE SHUTTLE BAY WITH ALL DESIRED INSTRUMENTS AND EQUIPMENT ATTACHED INSIDE THEIR PERIPHERY. THE COMPONENTS CAN THEN BE ASSEMBLED ON-ORBIT AS DESIRED. WHEN NECESSARY, THE TRIANGLES CAN BE REMOVED TO REPAIR OR REPLACE THEIR INSTRUMENTS. THE STRUCTURE CAN ALSO BE DISASSEMBLED FOR USE IN THE CONSTRUCTION OF LARGER GEODESIC SPHERES, IF NEEDED. SUCH TECHNOLOGIES ARE A NATURAL EXTENSION OF MODULARIZATION AND STANDARD INTERFACE SYSTEMS. THE ABILITY OF THESE STRUCTURES TO PERFORM AS STABLE, RIGID PLATFORMS FOR HIGH RESOLUTION INST REQUIRING GREAT

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any
Escape dV Required, m/s Ephemeris Accuracy, m

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0
Heat Rejection, W Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
THIS MISSION HAS BEEN SET ASIDE FOR LACK OF A CUSTOMER MISSION.

PAYLOAD ELEMENT NAME
LARGE SPACE STRUCTURE TECHNOLOGY

CODE
EACX2050

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name DICK GATES
Address WILLIAM WALES MSFC

Telephone 205/453-4195

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE A TECHNOLOGY BASE FOR SYSTEMS, IN THE LARGE STRUCTURES CLASS, REQUIRING CONSTRUCTION AND/OR ASSEMBLY UTILIZING SUPPORT FROM A MANNED ORBITAL STATION. THESE TECHNOLOGY DEVELOPMENT MISSION(S) WILL ALSO UTILIZE GROUND FACILITIES AND ORBITER TESTS FOR SMALL, SHORT DURATION, SEGREGATED EXPERIMENTS.

DESCRIPTION
THE MISSION PROPOSED WILL PROVIDE THE TECHNOLOGY REQUIRED FOR THE CONSTRUCTION AND ASSEMBLY OF LARGE STRUCTURAL COMPONENTS AND SYSTEMS WHILE ATTACHED TO AND SUPPORTED FROM A MANNED SPACE STATION. KEY ISSUES ASSOCIATED WITH THIS TECHNOLOGY DEVELOPMENT ARE: SUPPORT EQUIPMENT INTERFACES; MAN, MAN-MACHINE, AND MACHINE FUNCTIONS; DEVELOP CREW SKILL REQUIREMENTS AND SPACE STATION OPERATIONAL INTERFACE REQUIREMENTS. ROBOTIC CONSTRUCTIONS WILL ALSO BE CONSIDERED IN DEVELOPING THIS TECHNOLOGY.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00
Peak	0	0.00

( ) Continuous

Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
REDUNDANT WITH LSS-1 & LSS-2.

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PAYLOAD ELEMENT NAME
CONTROLLED ACCELERATION PROPULSI

CODE
BACX2651

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name DAVID C. BYERS
Address
JACK EVANS
GODDARD SPACE FLIGHT CEN

Telephone (216) 433-4000 X

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
DETERMINE THE FEASIBILITY, CHARACTERISTIC, CONSTRAINTS, AND INTERFACES OF PROPULSION SYSTEMS REQUIRED FOR CONTROLLED ACCELERATION OF SPACE SYSTEMS AND CORRELATE THE GROUND AND SPACE CHARACTERISTICS OF CANDIDATE CONCEPTS.

DESCRIPTION
CANDIDATE LOW THRUST PROPULSION CONCEPTS WILL BE ATTACHED TO THE SPACE STATION OR ASSOCIATED SPACE SYSTEM IF PROGRAM OBJECTIVES SO INDICATE. THE PROPULSION SYSTEMS WILL BE OPERATED TO DETERMINE THE FEASIBILITY OF AND CONSTRAINTS ON THEIR USE TO CONTROL ACCELERATIONS INDUCED BY NATURAL AND SPACE SYSTEM FORCES AND TORQUES ASSOCIATED DIAGNOSTICS WILL ASSESS PLUME CHARACTERISTICS WHICH CANNOT BE ADEQUATELY EVALUATED IN GROUND TESTS. THE PERFORMANCE AND LIFETIME WILL BE EVALUATED BY THE USE OF FLIGHT AND POST FLIGHT INSPECTIONS TO CORRELATE SPACE AND GROUND RESULTS. THE SPECIFIC PROPULSION CONCEPTS TO BE EVALUATED ARE TBD BUT WILL INCLUDE RESISTOJETS OPERATED (1) IN SEVERAL MODES WHICH AFFECT THEIR DYNAMIC THRUST CHARACTERISTICS AND (2) POSSIBLY WITH VARIOUS PROPELLANTS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	( ) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

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CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
REJECT

PAYLOAD ELEMENT NAME
TELEOPERATOR REAL TIME COMM

CODE
DACX2052

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name JAMES E. RANDOLPH M/S 156-220
Address JPL 4800 OAK GROVE DR.
PASADENA, CA 91109

Telephone (213) 354-2732

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
THIS EXPERIMENT WOULD EVALUATE THE PERFORMANCE OF A MAN IN CONTROL SITUATION TAKING INTO CONSIDERATION THE EFFECTS OF TIME DELAYS, VIDEO DATA COMPRESSION, ETC. IT WILL DETERMINE ACCEPTABLE LEVELS OF VIDEO DATA COMPRESSION AND COULD LEAD TO A LARGE "TELEPRESENCE" EXPERIMENT INCLUDING ADAPTIVE AUTOMATED CONTROL CONCEPTS.

DESCRIPTION
THE EXPERIMENT COULD BE A PART OF A LARGER "TELEPRESENCE" EXPERIMENT THAT WOULD BE PERFORMED TO DEMONSTRATE REAL-TIME, MAN-IN-THE-LOOP CONTROL OF FREE-FLYERS, FROM THE SPACE STATION. THE CURRENT "MULTIPLE ACCESS" PHILOSOPHY OF TDRSS IS NOT COMPATIBLE WITH MANY OF THE RF LINK REQUIREMENTS FOR THIS REAL-TIME CONTROL APPLICATION. DIRECT RF LINKS, WITH AN ASSOCIATED RF SUBSYSTEM, MUST BE DESIGNED AND EVALUATED.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

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CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
REJECT.

PAYLOAD ELEMENT NAME
LARGE ANTENNA DEVELOPMENT

CODE
BACK2053

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name W.L. GRANTHAM
Address LANGLEY CONTACT

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
PROVE ENABLING TECHNOLOGIES ASSOCIATED WITH SHORT AND LONG BASELINE LSA RECEIVER SYSTEM DESIGNS SUITABLE FOR RADIO ASTRONOMY AND SEARCH AND RESCUE USE.

DESCRIPTION
SHORT BASELINE - UTILIZE EXTREME ENDS OF SPACE STATION AS BASELINE SEPARATION OF INTERFEROMETRIC ANTENNAS.
LONG BASELINE - UTILIZE SPACE STATION AND FREE FLYER.
MICROWAVE RECEIVERS AND ANTENNAS WOULD BE IMPLEMENTED FOR ORBITAL OPERATION WITH ANTENNA BASELINE

LENGTHS UP TO 500 FT. KNOWN EARTH AND GALACTIC TARGETS WOULD BE USED TO EVALUATE SYTSEM DESIGNS AND

PERFORMANCE.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day
Operating	0	0.00
Standby	0	0.00

(X) Continuous

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Peak 0 0.00
Voltage, V 0 Frequency, Hz 0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0
Heat Rejection, W Operational Minimum 0 Maximum 0
Non-operational Minimum 0 Maximum 0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stoved)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assigments
Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
REJECT.

PAYLOAD ELEMENT NAME
FAB OF LIGHTWEIGHT CRYO HEAT PIP

CODE
BACX2054

CONTACT
Name CHARLES J. CAMARDA
Address

Telephone

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
DEVELOP THE TECHNOLOGY NECESSARY TO MANUFACTURE AND PROCESS HEAT PIPES USING CRYOGENIC WORKING FLUIDS (E.G., HYDROGEN, NITROGEN, OXYGEN, ETC.) IN A ZERO-G ENVIRONMENT.

DESCRIPTION
THE PURPOSE OF THE MISSION IS TO INVESTIGATE FABRICATION METHODS FOR MANUFACTURING VARIOUS TYPES OF LARGE LIGHTWEIGHT CRYOGENIC HEAT PIPES. TOWARD THIS END, SEVERAL TYPES OF WORKING FLUIDS, HEAT-PIPE CONFIGURATIONS, FABRICATION TECHNIQUES AND CLEANING AND PROCESSING PROCEDURESSHOULD BE INVESTIGATED. TYPES OF HEAT-PIPE CONFIGURATIONS MIGHT VARY FROM A SIMPLE CYLINDRICAL CONFIGURATION TO MORE COMPLEX DESIGNS SUCH AS A FLAT PLATE SANDWICH PANEL OR A VARIABLE CONDUCTANCE HEAT PIPE. FABRICATION TECHNIQUES SUCH AS DIFFUSION BONDING OR WELDING COULD BE INVESTIGATED TOGETHER WITH CLEANING, FLUID CHARGING, AND SEALING PROCEDURES. SEVERAL HEAT PIPES WILL BE FABRICATED AND TESTED IN SPACE AND THEIR PERFORMANCE RECORDED. EARTH TESTING WILL BE IMPOSSIBLE SINCE THE DESIGNS WILL BE ULTRALIGHTWEIGHT AND NOT CAPABLE OF CONTAINING THE HIGH INTERNAL PRESSURES OF THE CRYOGENIC WORKING FLUIDS AT AMBIENT TEMPERATURE.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stoved)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
REJECT.

PAYLOAD ELEMENT NAME
ADV ADAPTIVE CONTROL TECH DEMO

CODE
BACK2055

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name L.W. TAYLOR, JR
Address LANGLEY CONTACT

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
EVALUATE ADAPTIVE CONTROL TECHNIQUES REQUIRED BY ADVANCED SPACE STATION CONFIGURATIONS. THESE ADAPTIVE CONTROL TECHNIQUES WILL INCLUDE CLOSED-LOOP SYSTEMS IDENTIFICATION.

DESCRIPTION
ADVANCED ADAPTIVE CONTROL LAWS WILL BE PROVIDED AS SELECTABLE ALTERNATIVES TO OPERATIONAL CONTROL LAWS. VARIOUS ADVANCED TECHNIQUES WILL BE EVALUATED WITH THE OPERATIONAL SYTEM SERVING AS A BACKUP.

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stoved)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

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CREW REQUIREMENTS
Crew Size 0

Task Assignments

Skill						
Level						
Hours/Day						

Skills (See Table B)

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man Hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions
REJECT.

PAYLOAD ELEMENT NAME
SOLAR PUMPED LASERS

CODE
EACK2056

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 16

CONTACT
Name E.J. CONWAY
Address NASA LANGLEY RESEARCH CE

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 1

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 1996 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO DEMONSTRATE, CALIBRATE, AND TEST THE OPERATION OF A OPTICAL CONCENTRATOR. TO PROVIDE A REALISTIC COMPARISON OF SEVERAL SOLAR LASER TYPES.

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DESCRIPTION
THE MISSION WILL DEMONSTRATE FOR THE FIRST TIME SOLAR-PUMPED LASING USING THE FULL SOLAR SPECTRUM (RATHER THAN A SIMULATED SPECTRUM). IT WILL PROVIDE FOR THE ACCURATE MEASUREMENT OF SOLAR LASER EFFICIENCY WHICH IS SPECTRUM AND TEMPERATURE-DEPENDENET AND WILL PROVIDE FOR LONG-TERM OPERATION TO ASSESS LASANT STABILITY AND LASANT RECONSTITUTION EFFICIENCY. AN ASSESSMENT OF CONVERTER PERFORMANCE, EFFICIENCY, STABILIT FOR LONG-TERM OPERATION AND RESISTANCE TO ENVIRONMENTAL INTERFERENCE OR DEGRADATION WILL BE PERFORMED FOR A SET OF CONVERTORS. THE MISSION WILL BE THE FIRST SYSTEMS-LEVEL TEST OF LASER PROPULSION IN SPACE. IT WILL TE THRUST AND SPECIFIC IMPULSE AS WELL AS SYSTEM CHARACTERISTICS SUCH AS STEADY-STATE WALL TEMPERATURE, PROPELLANT MASS FLOW RATE.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km 500 Perigee, km 500 Tolerance + -
Inclination, deg 28.5 Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial (X) Solar ( ) Earth ( ) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	1000	12.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

C-4

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None (X) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External (X) Remote

Equipment ID/Function ( ) Pressurized (X) Unpressurized

Length: 6.00 meters Width: 1.00 meters Height: 1.00 meters (Stowed)

Length: 6.00 meters Width: 1.00 meters Height: 1.00 meters (Deployed)

Launch mass, kg: 99 Return mass, k2600

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 1

Skills (See Table B)

Task Assignments

Skill	3					
Level	3					
Hours/Day	4					

EVA (X) Yes ( ) No Reason INSTALLATION Hours/EVA 0.00

SERVICING/MAINTENANCE

Service:	Interval	0 days	Consumables	0 kg
	Returnables	0 kg	Man hours required	0.00
Configuration Changes:	Interval	0 days	Man/Hours Required	0.00
	Deliverables	0 kg	Returnables	0 kg

SPECIAL CONSIDERATIONS/See instructions

Boeing-Specific Input Data

MISSION TYPE	OPS CODE
Free Flyer	
( ) Not Serviced	F
( ) Remote TMS	FT
( ) Remote Manned	FM
( ) Serviced at Station (TMS Retrieved)	FST
( ) Serviced at Station (Self-propelled)	FS
Platform Based	
( ) Not Serviced	P
( ) Remote TMS	PT
( ) Remote Manned	PM
( ) Serviced at Station (TMS Retrieved)	PST
( ) Serviced at Station (Self-propelled)	PS
Other	
( ) Space Station Based	SS
( ) Sortie	SOR

CONSTRUCTION/SERVICING COMPLEXITY

( ) Low
( ) Medium
( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up	0.00
Down	0.00
Aero Return	0.00

Support Equipment

Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Stowed)
Length:	0.00 meters	Width:	0.00 meters	Height:	0.00 meters	(Deployed)

Mass: 0 kg

Manifest Restrictions

(X) No Restrictions
( ) Only with compatible payloads
( ) Fly-Alone
( ) Must have Docking Module

Length of Beam Fab	0.00
Number of Appendages	0
Number of Modules Required to Assemble the Payload	0

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- - - PRICE 84 - - -
ELECTRONIC ITEM

DATE 7-MAR-83 TIME 18:[illegible] FILENAME: REID2.DAT
(283010)

SOLAR PUMPED LASER

		UNIT WEIGHT	220.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	162.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	66.	-	66.
DESIGN	184.	-	184.
SYSTEMS	19.	-	19.
PROJECT MGMT	346.	-	346.
DATA	34.	-	34.
SUBTOTAL(ENG)	650.	-	650.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	1322.	-	1322.
TOOL-TEST EQ	575.	-	575.
SUBTOTAL(MFG)	1897.	-	1897.
TOTAL COST	2548.	-	2548.

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- - - PRICE 84 -
ELECTRONIC ITEM

DATE 4-MAR-83 TIME 10:38 (283010) FILENAME: REID2.DAT

SOLAR PUMPED LASER

		UNIT WEIGHT	220.00	MODE	1
PROTOTYPE QUANTITY	3.000	UNIT VOLUME	162.00	QUANTITY/NHA	1

PROGRAM COST($ 1000)	DEVELOPMENT	PRODUCTION	TOTAL COST
ENGINEERING			
DRAFTING	66.	-	66.
DESIGN	184.	-	184.
SYSTEMS	19.	-	19.
PROJECT MGMT	346.	-	346.
DATA	34.	-	34.
SUBTOTAL(ENG)	650.	-	650.
MANUFACTURING			
PRODUCTION	-	-	-
PROTOTYPE	1322.	-	1322.
TOOL-TEST EQ	575.	-	575.
SUBTOTAL(MFG)	1897.	-	1897.
TOTAL COST	2548.	-	2548.

DESIGN FACTORS	ELECTRONIC	MECHANICAL	PRODUCT DESCRIPTORS	
WEIGHT	5.000*	215.000	ENGINEERING COMPLEXITY	0.300
DENSITY	41.500	1.327*	PROTOTYPE SUPPORT	1.0
MFG. COMPLEXITY	10.313	7.640	PROTO SCHEDULE FACTOR	.250*
NEW DESIGN	0.000	0.200	ELECT VOL FRACTION	.001*
DESIGN REPEAT	0.000	0.000	PLATFORM	2.500
EQUIPMENT CLASS	*****	*****	YEAR OF TECHNOLOGY	1987*
INTEGRATION LEVEL	0.0	0.0	RELIABILITY FACTOR	1.0
			MTBF(FIELD)	121140*

SCHEDULE	START		FIRST ITEM		FINISH	
DEVELOPMENT	JAN 87	(7)	JUL 87*	(9)	APR 88*	(16)

SUPPLEMENTAL INFORMATION

YEAR OF ECONOMICS	1984	TOOLING & PROCESS FACTORS	
ESCALATION	0.00	DEVELOPMENT TOOLING	5.00
DEV COST MULTIPLIER	1.14		

COST RANGES	DEVELOPMENT	PRODUCTION	TOTAL COST
FROM	2205.	-	2205.
CENTER	2548.	-	2548.
TO	2926.	-	2926.

PAYLOAD ELEMENT NAME
MATERIALS PROC TECH-PROC & TECH

CODE
BACX2057

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name K. DEMEI
Address JOHNSON SPACE CENTER

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE A SCIENTIFIC AND TECHNOLOGICAL BASE FOR OPTIMIZING THE MAN MACHINE MIX FOR EXPEDITIOUSLY TRANSFORMING MATERIALS PROCESSING PHENOMENA IN LOW G ENVIRONMENT INTO COMMERCIALLY VIABLE PRODUCT LINES.

DESCRIPTION
SEE COMMERCIAL #BACX1005 AND BACX1006

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
(X) AC (X) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS

Monitoring Requirements:

( ) None ( ) Realtime ( ) Offline ( ) Other:

( ) Encription/Decription Required

( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00

( ) On-Board Data Processing Required

Description:

Data Types: ( ) Analog ( ) Digital Hours/Day 0.00

Film (Amount): 0 Voice (Hours/Day): 0.00

Live TV (Hours/Day): 0.00 Other:

On-Board Storage (Mbit): 0.00

Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0

Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL

(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS

Location ( ) Internal ( ) External ( ) Remote

Equipment ID/Function (X) Pressurized ( ) Unpressurized

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)

Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)

Launch mass, kg: 0 Return mass, kg:

Consumable Types

Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS

Crew Size 0

Skills (See Table B)

Task Assignments

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE

Service:	Interval	0 days	Consumables	0 kg
	Returnables	0 kg	Man hours required	0.00
Configuration Changes:	Interval	0 days	Man/Hours Required	0.00
	Deliverables	0 kg	Returnables	0 kg

SPECIAL CONSIDERATIONS/See instructions

PAYLOAD ELEMENT NAME
ELECTROPHORESIS SEPARATION

CODE
BACK2058

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

CONTACT
Name DAVID N. SUDDETH
Address GODDARD SPACE FLIGHT CEN

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF IMPROVED METHODS OF SEPARATING AND PURIFYING BIOLOGICAL, MEDICAL AND OTHER TYPES OF MATERIALS UNDER CONDITIONS OF VERY LOW (MILLI-G) GRAVITY.

DESCRIPTION
SEE COMMERCIAL # BACK1005

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0

Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE

Service:	Interval	0 days	Consumables	0 kg
	Returnables	0 kg	Man hours required	0.00
Configuration Changes:	Interval	0 days	Man/Hours Required	0.00
	Deliverables	0 kg	Returnables	0 kg

SPECIAL CONSIDERATIONS/See instructions

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PAYLOAD ELEMENT NAME
CRYOGENIC FLUID STORAGE TECH

CODE
EACX2062

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 16

CONTACT
Name
Address

Telephone

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 6

STATUS
( ) Operational ( ) Approved ( ) Planned (X) Candidate ( ) Opportunity

Desired First Flight, Year: Number of Flights Duration of Flight, Days

OBJECTIVE
TO DEVELOP THE TECHNOLOGY FOR ADVANCED INSULATION AND LONG LIFE REFRIGERATION/LIQUEFACTION SYSTEMS TO PROVIDE LONG TERM ORBITAL THERMAL CONTROL OF CRYOGENIC LIQUID STORAGE AND SUPPLY TANKS.

DESCRIPTION
SUBSCALE CRYOGENIC FLUID STORAGE TANKS AND REFRIGERATION/LIQUEFACTION SYSTEMS WOULD BE TESTED TO ESTABLISH STORAGE, TRANSFER, REFRIGERATION, AND GAUGING PERFORMANCE. THERMAL STUDY STATES, AND MAINTAINABILITY REQUIREMENTS WILL ALSO BE INVESTIGATED. SELECTED CONCEPTS WILL THEN PROVIDE DESIGN CRITERIA FOR CRYOGENIC FLUID STORAGE AND SUPPLY SYSTEMS FOR SPACE OPERATIONS.

ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes ( ) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Tolerance + -
Nodal Angle, deg Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known):
Pointing Accuracy, arc-sec Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC
Power, W Duration, Hrs/Day

Operating
Standby ( ) Continuous
Peak
Voltage, V Frequency, Hz

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): Frequency (MHz):
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day
Film (Amount): Voice (Hours/Day):
Live TV (Hours/Day): Other:
On-Board Storage (Mbit):
Data Dump Frequency (Per Orbit) Downlink command rate:
Recording Rate (KBPS) Downlink Frequency (MHz):

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THERMAL
(X) Active ( ) Passive
Temperature, deg C Operational Minimum Maximum
Non-operational Minimum Maximum
Heat Rejection, W Operational Minimum Maximum
Non-operational Minimum Maximum

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal (X) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 2.87 meters Width: 4.35 meters Height: 2.61 meters (Stowed)
Length: meters Width: meters Height: meters (Deployed)
Launch mass, kg: 3000 Return mass, kg: 2800
Consumable Types
Acceleration Sensitivity, (g) min: max:

CREW REQUIREMENTS
Crew Size 2 Task Assignments

Skills (See Table B)

Skill	3	10									
Level	3	3									
Hours/Day	3.00	3.00									

EVA (X) Yes ( ) No Reason SERVICE CRYO TANK Hours/EVA

SERVICING/MAINTENANCE
Service: Interval days Consumables kg
Returnables kg Man hours required
Configuration Changes: Interval days Man-Hours Required
Deliverables kg Returnables kg

SPECIAL CONSIDERATIONS/See instructions
THIS TDM WAS CREATED BY INTEGRATION OF BACK2015 AND BACK2016.
THIS HAS NOW BEEN INTEGRATED INTO BACK2064.

Boeing-Specific Input Data

MISSION TYPE — OPS CODE

Free Flyer

- ( ) Not Serviced — F
- ( ) Remote TMS — FT
- ( ) Remote Manned — FM
- ( ) Serviced at Station (TMS Retrieved) — FST
- ( ) Serviced at Station (Self-propelled) — FS

Platform Based

- ( ) Not Serviced — P
- ( ) Remote TMS — PT
- ( ) Remote Manned — PM
- ( ) Serviced at Station (TMS Retrieved) — PST
- ( ) Serviced at Station (Self-propelled) — PS

Other

- ( ) Space Station Based — SS
- ( ) Sortie — SOR

CONSTRUCTION/SERVICING COMPLEXITY

- ( ) Low
- ( ) Medium
- ( ) High

Operations Times

OTV Up/Down	days
OTV or TMS on Orbit	days
Mission Use	days/year
IVA Service	man-days/year
EVA Service	man-days/year
Experiment Ops	man-days/year
Service Frequency	times/year

Delta Velocities

Up

Down

Aero Return

Support Equipment

Length:	meters	Width:	meters	Height:	meters	(Stowed)
Length:	meters	Width:	meters	Height:	meters	(Deployed)

Mass: kg

Manifest Restrictions

- ( ) No Restrictions
- ( ) Only with compatible payloads
- ( ) Fly-Alone
- ( ) Must have Docking Module

Length of Beam Fab

Number of Appendages

Number of Modules Required to Assemble the Payload

PAYLOAD ELEMENT NAME
COMPOUND SEMICONDUCTOR CRYSTALS

CODE
BACK2076

CONTACT
Name DR. R. K. CROUCH
Address DR. A. L. FRIPP

Telephone 928-3535

TYPE
( ) Science and Applications (Non-comm.)
( ) Commercial
(X) Technology Development
( ) Operations
( ) Other
( ) National Security
Type number (see table A) 0

Importance of the Space Station to this Element
1 = Low Value, But Could Use
10 = Vital
Scale = 0

STATUS
( ) Operational ( ) Approved ( ) Planned ( ) Candidate (X) Opportunity

Desired First Flight, Year: 0 Number of Flights 0 Duration of Flight, Days 0

OBJECTIVE
TO PROVIDE LARGE SCALE FACILITIES FOR THE GROWTH OF COMPOUND SEMI-CONDUCTOR CRYSTALS.

DESCRIPTION
SEE COMMERCIAL #

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ORBIT CHARACTERISTICS
Geosynchronous Orbit ( ) Yes (X) No
Apogee, km Perigee, km Tolerance + -
Inclination, deg Any Tolerance + -
Nodal Angle, deg Any Ephemeris Accuracy, m
Escape dV Required, m/s

POINTING/ORIENTATION
View Direction ( ) Inertial ( ) Solar ( ) Earth (X) Any
Truth Sites (if known)
Pointing Accuracy, arc-sec 0.00 Field of View (deg)
Pointing Stability (Jitter), arc-sec/sec 0.00
Special Restrictions (Avoidance)

POWER
( ) AC ( ) DC

	Power, W	Duration, Hrs/Day	
Operating	0	0.00	
Standby	0	0.00	(X) Continuous
Peak	0	0.00	
Voltage, V	0	Frequency, Hz	0

DATA/COMMUNICATIONS
Monitoring Requirements:
( ) None ( ) Realtime ( ) Offline ( ) Other:
( ) Encription/Decription Required
( ) Uplink Required: Command Rate (KBS): 0 Frequency (MHz): 0.00
( ) On-Board Data Processing Required
Description:
Data Types: ( ) Analog ( ) Digital Hours/Day 0.00
Film (Amount): 0 Voice (Hours/Day): 0.00
Live TV (Hours/Day): 0.00 Other:
On-Board Storage (Mbit): 0.00
Data Dump Frequency (Per Orbit) 0 Downlink command rate: 0
Recording Rate (KBPS) 0.00 Downlink Frequency (MHz): 0.00

THERMAL
(X) Active ( ) Passive

Temperature, deg C	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0
Heat Rejection, W	Operational Minimum	0	Maximum	0
	Non-operational Minimum	0	Maximum	0

EQUIPMENT PHYSICAL CHARACTERISTICS
Location ( ) Internal ( ) External ( ) Remote
Equipment ID/Function (X) Pressurized ( ) Unpressurized
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Stowed)
Length: 0.00 meters Width: 0.00 meters Height: 0.00 meters (Deployed)
Launch mass, kg: 0 Return mass, kg:
Consumable Types
Acceleration Sensitivity, (g) min: 0.00E+00 max: 0.00E+00

CREW REQUIREMENTS
Crew Size 0 Task Assignments

Skills (See Table B)

Skill						
Level						
Hours/Day						

EVA ( ) Yes (X) No Reason Hours/EVA 0.00

SERVICING/MAINTENANCE
Service: Interval 0 days Consumables 0 kg
Returnables 0 kg Man hours required 0.00
Configuration Changes: Interval 0 days Man/Hours Required 0.00
Deliverables 0 kg Returnables 0 kg

SPECIAL CONSIDERATIONS/See instructions

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APPENDIX 1

SUMMARY OF STUDY TASKS AND FINAL REPORT TOPICAL CROSS REFERENCE

SUMMARY OF STUDY TASKS

The study accomplished 3 major objectives:

1. Identified, collected, and analyzed science, applications, commercial, national security, technology development and space operations missions that require or benefit by the availability of a permanently manned space station. The space station attributes and characteristics that will be necessary to satisfy these requirements were identified.
2. Identified alternative space station architectural concepts that would satisfy the user mission requirements.
3. Performed programmatic analyses to define cost and schedule implications of the various architectural options.

Figure A-1 shows the summary task flow that was used to accomplish these objectives.

In Tasks 1.1 thru 1.5, missions were identified, screened, and their needs and benefits analyzed. Mission investigators were assigned to each of the mission classes (science and applications, commercial, technology development, space operations, and national security). In general, these investigators (and their supporting subcontractors) contacted potential users and analyzed available data to characterize potential mission needs. They worked in conjunction with designers and operations analysts to characterize the potential payloads and operational interfaces. In Task 1.6, the missions were allocated to orbits, and were assigned to platforms, free-flyers, or space stations, as appropriate. During Task 1.7, the various missions were integrated into time-phased mission models. The time-phasing took into account available budgetary constraints, prioritization, time sequencing constraints, and transportation availability. A computer program was used to process the integrated time-phased mission model to derive a year-by-year shuttle manifest schedule. The computer program was also used for Task 1.8 to derive the integrated time-phased space station accommodation requirements, i.e., power and thermal demands, berthing requirements, and crew skills. These mission analyses have been reported in Volume 2 of the final report.

Also included in Volume 2 are the results from Task 1.10. In this task, some of the primary commerical opportunities were examined to define the economics of the use of a space station and to define the benefits of doing business on a space station relative to doing it using the shuttle.

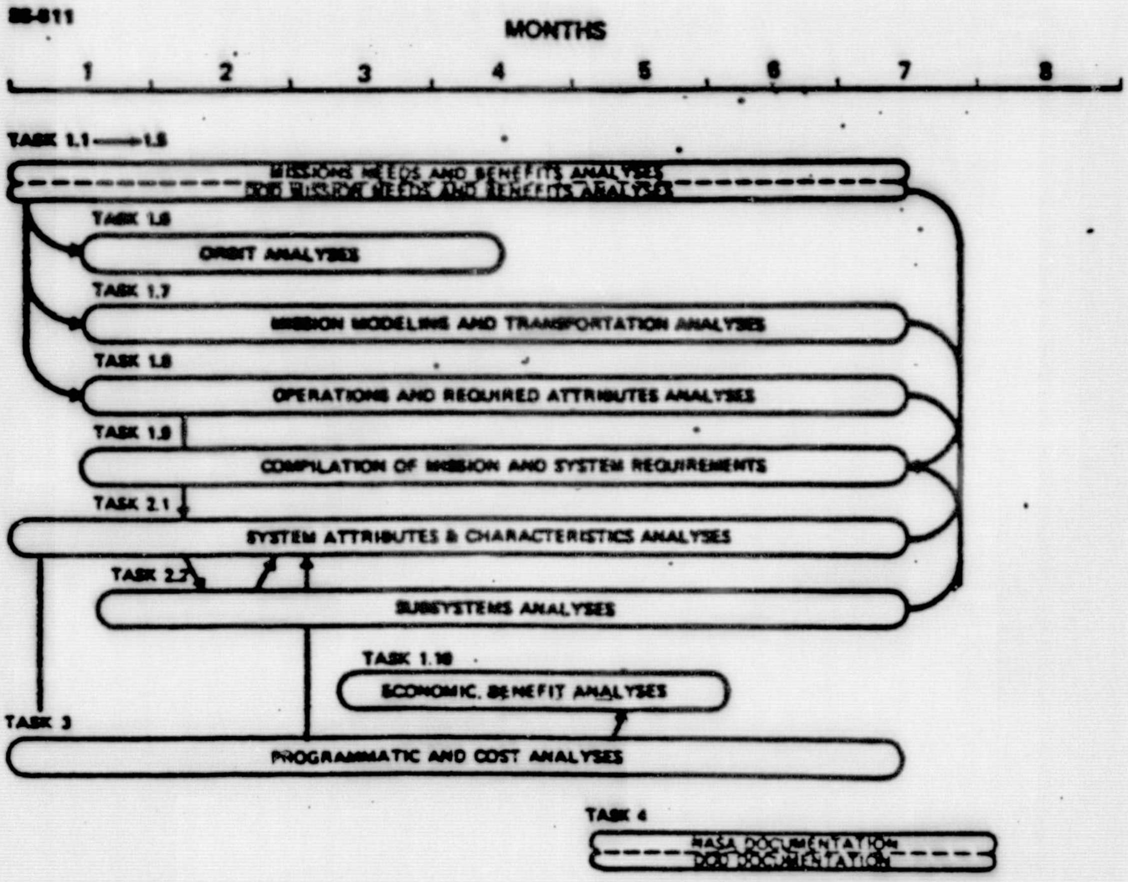

Figure A-1. Summary Diagram Outlines Major Task Traffic

In Task 1.9, mission requirements and space station design requirements were identified. An aggregate of these requirements are reported in Volume 3.

Volume 4 of the final report contains the results from Tasks 2.1, 2.2 and 3. Specifically in Task 2.1, a methodology for defining realistic architectural options was established. This methodology was applied using the requirements defined in the previous tasks. From this, we have created 3 architectural options and have shown some reference space station configuration concepts for each architectural option. Task 2.2 was performed to obtain analysis and trades of some of the principle subsystems, i.e., data management, environmental control and life support, and habitability. Task 3 provides the analyses of programmatics and cost options associated with the concepts derived during the study.

A cross reference guide to enable locating study topics within the volumes and volume sections of the final report is presented in Table A-1.

TABLE A-1

Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Commercial Missions											
o Communication Satellites	o	3.2.1				o		o			
o Reconfigurable											
o Multibeam											
o Materials Proc.	o	3.2.2		I-1.3.2.3, 1.2.2.1		o		o			
o Semiconductors											
o Biological											
o Glass Fibers											
o Earth Observation		3.2.3									
Industrial Services		3.2.4						o			
o Crew Selection & Training											
o In-Space OPS											
Technology Demo's	o	3.3				o			o		
Space Operation	o	3.4				o					
o Construction											
o Flight Support											
o Servicing											

TABLE A-1

Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Science & Applications Missions											
o Space Environment Missions	o	3.1.2				o	o				
o Astrophysics Missions	o	3.1.3				o	o				
o Earth Environment Missions	o	3.1.4				o	o				
o Life Sciences Missions	o	3.1.5				o	o				
o Materials Science Missions	o	3.1.6					o				
Scenarios of Operational Capabilities	o	4.0, 5.0				o					
o Mission Constrained											
o Station Constrained											
o No Space Station											

TABLE A-1

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Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Mission Requirements Summary		5.0									o
o Low Inclination Space Station	o	5.2,5.3	3.2.1	I-1.2.2.4		o					o
o High Inclination Space Station	o	5.2,5.3		I-1.2.2.4		o					o
o Platform only	o	5.4				o					o
o Manifesting o Shuttle o OTV o TMS	o	5.2, 5.3, 5.4				o					o
o Crew Size	o	5.2,5.3 5.4	3.2.1			o					o
o Crew Skills		5.2.5.3 3.1.2.5, 3.1.3.5, 3.1.4.5, 3.1.5.5, 3.2.1.5, 3.2.2.6, 3.2.3 3.3		II-2.2.3							o

TABLE A-1

Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Mission Requirements Summary (Continued)											
o Accommodations Reqm'ts	o	2.2 5.2,5.3	3.2.1			o					o
o Power		5.4	I-1.2.1.2, 1.2.2.4 1.2.3.3 1.2.3.4								
o Internal Vol											
o Berthing Ports											
Benefits		6.0									
o Semiconductor Manufacturing	o	6.2				o					o
o Glass Fiber Manufacturing	o	6.3				o					o
o Communications Satellite Assembly	o	6.4				o					o
o Biological Materials Manufacturing	o	6.5				o					o

TABLE A-1

Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Mission Analysis											
o Manifesting Analysis Software	o	2.2				o					o
o Accommodations & Crew Activity Analysis Software	o	2.2				o					o
o Crew Skills											
o Crew Size											
o Berthing Ports											
o Electrical power											
o Internal volume											
Design Requirements											
o Mission Accommodation Reqm'ts		5.0	3.2								
o Interfaces				II-10.0						o	
o Berthing/Docking Port				I-1.3.2.1							
o Hangar		3.3		I-1.3.2.2							

TABLE A-1

Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Architectural Options											
o Architecture Development Methodology	o			I-1.1		o				o	
o Space Station Architectural Options	o			I-1.2		o				o	
Build-up and Growth	o	5.0		I-1.2.3.4, 1.3.1.3, 1.3.2.3, 1.3.3.3							
Data Management											
o Architecture				II-3.2						o	
o In-Flt Checkout				II-3.3						o	
o Space-Ground Integration				II-3.4						o	
o Ground Lab				II-3.5						o	
o Software Devel.				II-3.6						o	
o Hardware Stds				II-3.7						o	
o Software Stds				II-3.8						o	
o Verif/Valid.				II-3.9						o	

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Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Logistics/Resupply											
o Logistics Module				II-7.1, 7.3,7.4							
o Resupply Reqm'ts				II-7.2							
Environmental Control and Life Support Subsystem				II-5.0						o	
o ECLS Evolution				II-5.2.1, 5.3.2						o	
o Safe Haven Logistics Module				II-5.2.1						o	
o Air Revitalization System				II-5.0,5.3.2						o	
o Water Revitalization System				II-5.0,5.3.2						o	
o Performance and Loads Specification										o	
o Overboard Venting				II-5.2.1,5.2.2						o	
o Architecture				II-5.2.1						o	
o Water Recovery System				II-5.0,5.3.2						o	
o CO_2 Concentration				II-5.0,5.3.2						o	
o Regenerative-Fuel-Cell-Based ECLS				II-5.0,5.2.1, 5.3.2						o	
o Recommendations				II-5.0, 5.3.2						o	
EVA/EMU				II-5.0, 5.2.2						o	

TABLE A-1

Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Communications & Tracking Subsystem			3.2.2.1.11	II-4.0						o	
Manipulator System				II-6.0						o	
Pointing Systems				II-8.0						o	
Thermal Management				II-9.0						o	
Crew				II-2.0							
o Tasks				II-2.2						o	
o Skills		5.2.5.3 3.1.2.5, 3.1.3.5, 3.1.4.5, 3.1.5.5, 3.2.1.5 3.2.2.6, 3.2.3 3.3		II-2.2.3							
o Capabilities				II-2.2.2						o	
o Role Relationships				II-2.3.2						o	
o Accommodations			3.2.2.1.11	II-2.4						o	

TABLE A-1

Final Report Topical Cross Reference Guide

Topic	Vol. 1 Exec Summ	Vol. 2 Mission Anal	Vol. 3 Rqm'ts	Vol. 4 Archit	Vol. 5 DoD	Vol. 6 Final Brief	Vol. 7-1 Sci/App Data Book	Vol. 7-2 Commer Data Book	Vol. 7-3 Tech Demo Data Book	Vol. 7-4 Archit Data Book	Vol. 7-5 Mission Data Book
Crew (Continued)											
o Habitability	o		3.2.2.1.11	II-2.0,2.4						o	
o IVA Work Stations				II-2.5.2						o	
o EVA Work Stations				II-2.5.3 II-5.2.2						o	
o Maintenance				II-2.5.4						o	
o Stowage			3.2.2.1.11							o	
o Windows			3.2.2.1.11	II-2.4.1						o	
o Hygiene			3.2.2.1.11	II-2.4.2.4						o	
o Scheduling			3.2.2.1.11	II-2.3.1						o	

APPENDIX 2

KEY TEAM MEMBERS

KEY TEAM MEMBERS

Subject	Boeing Team	Subcontractor Team	
Study Manager	Gordon Woodcock	ADL:	Dr. Peter Glaser
		Battelle:	Kenneth E. Hughes
		ECON:	John Skratt
		ERIM:	Albert Sellman
		Hamilton Standard:	Harlan Brose
		Intermetrics:	John Hanaway
		Life Systems:	Franz Shubert
		MRA:	Col. Richard Randolph (Ret.)
		NBS:	Dr. B. J. Bluth
		RCA:	Dr. Herbert Gurk
		SAI:	Dr. Hugh R. Anderson
Technology Manager	Dr. Richard L. Olson		
Mission Analysis			
Science & Applications	Dr. Harold Liemohn	SAI:	Dr. Hugh R. Anderson (Environmental Science)
	David Tingey (Earth Obs.)		Dr. Peter Hendricks (Meterology/ Oceanography)
	Dr. Derek Mahaffey (Mission Integration)		Dr. Gil Stegen
	Melvin W. Oleson (Life Sciences)		Dr. John Wilson (Life Sciences)
	Dr. Robert Spiger (Plasma physics, astro-physics, solar physics)		Dr. Robert Loveless (Integration)
			Dr. Robin Muench
			Dr. Stuart Gorney (Life Sciences)
			Ms. Monica Dussman (Life Sciences)
		ERIM:	Albert Sellman (Earth Obs.)
			Dr. Irvin Sattinger (Earth Obs.)
Commercial	Dr. Harvey Willenberg	RCA:	Dr. Herbert Gurk
			Thaddeus (Ted) Hawkes
		ADL:	Dr. Peter Glaser
		Battelle:	Dr. Kenneth E. Hughes
		MRA:	Col. Richard Randolph (Ret.)
			Robert Pace

KEY TEAM MEMBERS (Cont'd)

Subject	Boeing Team	Subcontractor Team	
Mission Analysis (Cont'd)			
Technology Demonstrations	George Reid Dr. Alan G. Osgood David S. Parkman Steve Robinson Richard Gates Tim Vinopal		
National Defense	Robert S.Y. Yoseph	ERIM:	Mirko Najman
Space Operations	Keith H. Miller		
Architecture and Subsystems			
Architecture & Configurations	John J. Olson Brand Griffin Tim Vinopal David S. Parkman Steve Robinson		
Communications		RCA:	Donald McGiffney
Crew Systems	Keith H. Miller George Reid Dr. Alan G. Osgood	NBS:	Dr. B. J. Bluth
Data Management and Software	Les Holgerson	Intermetrics:	John Hanaway
ECLSS	Keith H. Miller	Ham Std:	Harlan Brose Ross Cushman Al Boehm Ken King Todd Lewis
		Life Systems:	Dr. R. A. Winveen Franz Schubert Dr. Dennis B. Heppner
Operations Analysis	Keith H. Miller George Reid Dr. Alan G. Osgood		
Orbit Analysis	Dani Eder		

KEY TEAM MEMBERS (Cont'd)

Subject	Boeing Team	Subcontractor Team	
Architecture and Subsystems (Cont'd)			
Orbit/Survivability Analysis	Stephen W. Paris Merri Anne Stowe		
C^3I	H. Paul Janes		
Radiation Effects	Dr. William C. Bowman		
Requirements Analysis	Lowell Wiley		
Programmatics & Cost			
Cost Analysis	Ken verGowe	ECON:	Ed Dupnick
Programmatics	Gordon Woodcock		

APPENDIX 3

ACRONYMS AND ABBREVIATIONS

LIST OF ACRONYMS AND ABBREVIATIONS

AAP	Airlock Adapter Plate
AC	Alternating Current
ADM	Adaptive Delta Modulation
AM	Airlock Module
APC	Adaptive Predictive Coders
APSM	Automated Power Systems Management
ACS	Attitude Control System
ARS	Air Revitalization System
ASE	Airborn Support Equipment
BIT	Built in Test
BITE	Built in Test Equipment
CAMS	Continuous Atmosphere Monitoring System
C&D	Controls and Displays
C&W	Caution and Warning
CCA	Communications Carrier Assembly
CCC	Contaminant Control Cartridge
CCTV	Closed Circuit Television
CEI	Critical End Item
CER	Cost Estimating Relationship
CF	Construction Facility
CMG	Control Moment Gyro
CMD	Command
CMDS	Commands
CO_2	Carbon Dioxide
CPU	Computer Processor Units
CRT	Cathode Ray Tube
dB	Decibels
DC	Direct Current
DCM	Display and Control Module
DDT&E	Design, Development, Test, and Evaluation
DOD, DoD	Department of Defense
DT	Docking Tunnel
DM	Docking Module
DMS	Data Management System
DSCS	Defense Satellite Communications System
ECLSS	Environmental Control/Life Support System
EDC	Electrochemical Depolarized CO_2 Concentrator
EEH	EMU Electrical Harness
EIRP	Effective Isotropic Radiated Power
EMI	Electromagnetic Interference
EMU	Extravehicular Mobility Unit
EPS	Electrical Power System
ET	External Tank
EVA	Extravehicular Activity
EVC	EVA Communications System
EVVA	EVA Visor Assembly
FM	Flow Meter
FMEA	Failure Mode and Effects Analysis
ftc	Foot candles
FSF	Flight Support Facility
FSS	Fluid Storage System
GaAs	Gallium Acsenide

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

GN&C	Guidance, Navigation and Control
GEO	Geosynchronous Earth Orbit
GHZ	Gigahertz
GPC	General Payload Computer
GPS	Global Positioning System
GSE	Ground Support Equipment
GSTDN	Ground Satellite Tracking and Data Network
GFE	Government Furnished Equipment
GTV	Ground Test Vehicle
HLL	High Level Language
HLLV	Heavy Lift Launch Vehicle
HM	Habitat Module
HMF	Health Maintenance Facility
HPA	Handling and Positioning Aide
HUT	Hard Upper Torso
Hz	Hertz (cycles per second)
ICD	Interface Control Document
IDB	Insert Drink Bag
IOC	Initial Operating Capability
IR	Infrared
IVA	Intravehicular Activity
JSC	Johnson Space Center
KBPS	Kilo Bits Per Second
KM, Km	Kilometers
KSC	Kennedy Space Center
lbm	Pounds Mass
LCD	Liquid Crystal Display
LCVG	Liquid Cooling and Ventilation Garment
LED	Light Emitting Diode
LEO	Low Earth Orbit
LiOH	Lithium Hydroxide
LM	Logistics Module
LPC	Linear Predictive Coders
LRU	Lowest Replaceable Unit
LSS	Life Support System
LTA	Lower Torso Assembly
LV	Launch Vehicle
lx	Lumens
MBA	Multibeam Antenna
mbps	Megabits per second
MHz	Megahertz
MMU	Manned Maneuvering Unit
MM-Wave	Millimeter wave
MOTV	Manned Orbit Transfer Vehicle
MRWS	Manned Remote Work Station
MSFN	Manned Space Flight Network
N/A	Not Applicable
NBS	National Bureau of Standards
NSA	National Security Agency
N	Newton
NiCd	Nickel Cadmium
NiH_2	Nickle Hydrogen

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

Nm,nm	Nautical miles
N/m^2	Newtons per meter squared
OBS	Operational Bioinstrumentation System
OCS	Onboard Checkout System
OCP	Open Cherrypicker
OMS	Orbital Manuevering System
OTV	Orbital Transfer Vehicle
PCM	Pulse Code Modulation
PCM	Parametric Cost Model
PEP	Power Extension Package
PIDA	Payload Installation and Deployment Apparatus
P/L	Payload
PLSS	Portable Life Support System
PM	Power Module
POM	Proximity Operations Module
ppm	Parts per Million
PRS	Personnel Rescue System
PSID	Pounds per Square Inch Differential
RCS	Reaction Control System
REM	Roentgen Equivalent Man
RF	Radio Frequency
RFI	Radio Frequency Interference
RMS	Remote Manipulator System
RPM	Revolutions Per Minute
RPS	Real-time Photogrammetric System
SAF	Systems Assembly Facility
SAWD	Solid Amine Water Desorbed
SPGaAs	Space Produced Gallium Arsenide
scfm	Standard Cubic Feet per Minute
SCS	Stability and Control System
SCU	Service and Cooling Umbilical
SDV	Shuttle - Derived Vehicle
SDHLV	Shuttle - Derived Heavy Lift Vehicle
SEPS	Solar Electric Propulsion System
SF	Storage Facility
SM	Service Module
SOC	Space Operations Center
SOP	Secondary Oxygen Pack
SRB	Solid Rocket Booster
SRMS	Shuttle Remote Manipulative System
SRU	Shop Replacable Units
SSA	Space Suite Assembly
SSME	Space Shuttle Main Engine
STS	Space Transportation System
SSP	Space Station Prototype
STAR	Shuttle Turnaround Analysis Report
STDN	Spaceflight Tracking and Data Network
STE	Standard Test Equipment
TBD	To Be Determined
TDRSS	Tracing and Data Relay Satellite System
TFU	Theoretical First Unit
TGA	Trace Gas Analyzer

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

TIMES	Thermoelectric Integrated Membrane Evaporation System
TLM	Telemetry
TM	Telemetry
TMS	Teleoperator Maneuvering System
TT	Turntable/Tilttable
TV	Television
UCD	Urine Collection Device
VCD	Vapor Compression Distillation
VDC	Volts Direct Current
VLSI	Very Large Sacle Integrated Circuits
VSS	Versatile Servicing Stage
WBS	Work Breakdown Structure
WMS	Waste Management System